Jones

CONTRIBUTIONS to

WESTERN BOTANY NO. 16.

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BOTANIZING IN ARIZONA

Some thirty-six years ago I spent a delightful month in the Catalina, Santa Rita, and Huachuca mountains of Arizona, during the period of summer rains. The flora was a garden all over the region. I spent a week at Fort Huachuca, but I did not get to visit the northern end of the Huachucas where Lemmon had spent a month and got a number of new species, and several Mexican species not before known in the U. S. For this reason I have always wanted to make a more thorough examination of the Huachucas. Recently I also learned of botanical work in the Baboquivori mountains which had turned up other Mexican species. So in September and October, 1929, I had a month's leisure and made the trip detailed below.

On September 16, 1929, I left Claremont, California, driving to Mecca, where I stayed over night. There were no flowers of interest on the way, due to the dryness. On the 17th there was little of interest on the way till I passed over the divide east of Shafer's well, here and there were little patches of green, due to recent rains, where Euphorbias had come up. At the Hayfields, a few miles farther east, I searched for annuals among the Mesquit, creosote bushes and Holacantha Emoryi. I found much Boerhaavia, annual Bouteloua, Hilaria rigida, and Tribulus. There was little else in bloom. Holacantha was in fine fruit with the grape-like clusters erect at the ends of the spiny stems. This is the most forbidding shrub of them all, being 6-10 feet high and much and intricately and rigidly branched, and each branch ending in a sharp spine. The whole mass forms a clump about twice as high as wide, and is shunned by all animals. The plants are leafless and with green stems, slow growers and with very hard wood. The trunks rarely get over 4 inches thick, and have rather thin bark somewhat shreddy on the older parts.

Going east toward Desert Center green patches were more frequent and in a few places there was much grass that had come up since the

rains. It should be remembered that there had been practically no rain west of Shafer's well except one hard shower a week or two ago. East of there a few showers had wet the ground somewhat and encouraged plants to grow here and there where water had fallen, and the tracks of the showers could be seen in the green that came up after them. As I went eastward the evidences of moisture increased somewhat but at no place had there been anything like a bountiful supply of water.

On the hillsides just east of the Colorado river near Blythe were a few Euphorbias, but only in patches. Going over the hills on the road to Quartzite a few things of interest were in bloom, and there were several species of Euphorbia growing flat on the ground. At a distance they all look alike, but on closer inspection I found at least three species. There was a brown leaved one flat on the ground, corresponding to E. serpyllifolia. Then there was a lemon-yellow one raised a little above the ground but spreading out flat that also had the character of serpyllifolia. Then there was another species (setiloba) that was very hairy and seemingly glandular, and flat on the ground. Occasionally perennials would appear of the Fendleri group.

It had been threatening rain all day, and finally about dark the rain began to pour down, and the wind blew a gale. I spent some time there getting what was in bloom. The next day the ground was covered with many pools of water and the road was washed out in places. I had two main objects of the trip. One object was to visit the S. H. mountains some 20 miles south of Quartzite, where in the previous December I had gone to see the desert palm that Cook had called Washingtonia Arizonica. These are the highest range of western Arizona and should have plants of interest on them. I drove along the blind road seeking a turnoff to go to them, but all signs had been washed away and I missed the place to turn out into the brush and went on some ten miles before I was sure I had missed the place. Conditions were not very attractive any way and so I decided to pass them by, and went on to Dome, where the main overland road east of Yuma passes, and by night landed at Mohawk, where I did some collecting. Conditions were still bad, for there had been very little rain, but as I went eastward things gradually got better till at Ajo grass was everywhere among the brush, and many plants were coming in. From Ajo I turned south over the new cutoff toward Tucson instead of going to Gila Bend. Toward night I came to Sells, which is on the Papago Indian reservation. My main objective was the Government station on the Baboquivori mountains, and Sells was the nearest on the main highway. I was directed to go to Pawi, an Indian school, and then turn east for the mountains, which towered up to the east. It was a little skittish going blindly far away from anywhere on the Tropical desert, and night coming on. But I knew if I did not find the place I could camp in the brush and return the way I came. At the school the priest told me to take the main traveled road wherever there was a fork and not to go to the right (which was toward the mountain). By and by it got dark, and the road steadily worse, but I kept bumping along, following my nose. At last I saw a

white gate ahead which meant a station. Driving up to the spacious house I sang out and knocked but no response. I decided to drive into a shed and camp. Just then an Indian came up and said he was the caretaker, and everybody was away. He asked me if I had a key. I said "yes," and so I tried the door with my pass key and it opened. So he told me to go in and make myself at home, which I did. It was still baking hot. The next morning I browsed around and found that a woman kept house there and everything was handy for getting one's own meals, and which I proceeded to do.

After breakfast I took my portfolio and struck out for flowers. It was a vegetable paradise, flowers everywhere and in great variety, all in the Tropical life zone. I soon had every drier full and an overflow. It took me three days to get the entire flora near the station. Then it rained. The floodgates of heaven opened and the water just poured down in sheets and everything was afloat. I never saw such a storm. In half an hour it was all over and nature smiled again just as though she had never kicked up her heels. The next day it rained just as hard for an hour and at the same time of day. The dry wash that drains the region and usually is a dry sand bed 30 feet wide, was now 60 feet wide and with a great torrent of raging water four feet deep, tearing up everything in its wake. In four hours afterward everything smiled again just as before and the wash was dry. I anticipated much trouble in crossing the wash the next day on my way out, but had no grief.

The region about the station is Tropical, the vegetation being mesquit, and creosote bush along with some Chilopsis, catsclaw (Mimosa and Acacia), etc., along the wash which is an open valley a few hundred feet below the general mesa region which slopes quickly into it. The topography of the region shows that it is very old geologically. The range, the Baboquivori, from which the region was derived by erosion, is still little more than a hogback rising half a mile into the sky and which runs some 50 miles north and south and slopes sharply into the mesa region, and its canons are short and sharp, but with few real cliffs, and with rather wide boulder strewn beds, where water crops out wherever the slope flattens down a little, and then disappears again in the sand. There seem to be no perennial streams. Whatever water there is goes mostly to the plain by underground seepage. Around the water there are some cotton woods (Populus Fremonti) and black willow (Salix Bonplandiana) and ash. As we get really into the higher canons there come in the live oaks. The elevation of the station is hardly 3,000 feet above the sea, and for this reason it is very hot, and there is no snow and little frost. The formation of the country is mostly eruptive, and the ground is covered with this debris in the form of gravel and sand. There is no sod, the perennial grasses growing in tufts. The soil is heavily impregnated with iron and therefore is red. About a quarter mile above the station, east, the eruptive rock crops out in low cliffs and rocky draws, forming shelter for many ferns. It is here that Erythrina grows along with Eysenhardtia. Erythrina reminds one very much of the red bud, but the pods are quite different,

reminding one of Pithecollobium dulce. The ferns are Northolaena sinuata and Hookeri. The latter spreads by underground rootstocks in all directions and forms large areas often 6 feet in diameter, with single stalks scattered throughout. Cheilanthes Lindheimeri abounds at the foot of rocks. The ground in all directions is covered with innumerable tufts of grasses which were in full bloom. Andropogon saccharoides was rather common among the rocks. Bouteloua polystachya, hirsuta, bromoides, and racemosa were common and mostly ripe, the spikelets making annoying stickers in the stockings as they fell off as one walked through the grass, and worked through to the skin. In the flat areas Leptochloa dubia was frequent. Muhlenbergia debilis was everywhere. M. Porteri was among the rocks and brush. Aristidas were very common in tufts. Epicampes distichophylla and rigens were frequent, particularly among the rocks and on slopes. Distichopylla is a very conspicuous grass growing in big tufts 3-4 feet high, with its waving plumes of flowers. Eragrostis lugens was still more common on slopes. Pappophorum apertum and Lycurus phleoides were also common. There was an Arundo-like grass out of flower and fruit, rather common among the rocks. On the plains Yucca elata was common, Yucca macrocarpa was less common, but they did not extend up on the mountain sides. Dasylirion erumpens was frequent among the rocks. In the draws where there was some moisture Salix Bonplandiana occurred along with Populus Fremonti, and Celtis occidentalis. On the slopes near the water holes was Aristolochia Watsoni and Acalypha Virginica. Allionia incarnata was common. Boerhaavia intermedia and scandens were quite common. Gomphrena nitida and Rivina phytolaccoides were occasional. I was surprised to find Iresine celosioides rather common. Eriogonum Wrightii was scattered over the hills. Portulaca suffrutescens was quite common among the rocks. Also Talinum paniculatum. Euphorbia serpens, a rooting perennial, which Standley calls an annual, was frequent along the sides of little draws and conspicuous from its abundance of foliage and scanty fruit. Other species were E. hypericifolia, and pediculifera, and chaetocalyx. Simmondsia was scattered over the hills. Cassia nictitans was rather common in open places with other weeds. Erythrina was the characteristic shrub growing among the rocks, along with Eysenhardtia orthocarpa and Cologania longifolia, and Phaseolus acutifolius and tenuifolius. Dalea formosa was common, and Crotalaria lupulina. Desmodium batocaulon, Metcalfi, and Neo-Mexicanum were frequent. Occasionally I saw Philadelphus microphylla and Dodonaea viscosa. Ayenia pusilla and Californica were common. Ingenhouzia triloba was found now and then along stream-beds. Echinocactus acanthodes and LeContei occur scatteringly. The creosote bush is everywhere. The wild Muskmelon, Apodanthera, is common, as is also the climbing wild cucumber, Echinopepon Wrightii. The wild ground cherry Physalis lobata and Wrightii occurred. Wild morning glories were common in 3 species. Verbena perennis grew on the hills. The Mexican species Ruellia tuberosa, and Parryi, and Tetramerium hispidum and Ecliptera Torreyi grew in the shade of bushes. Another Mexican plant was Plumbago scandens climbing

among the bushes. A new shrub, Amorpha, grew along with Eysenhardtia. The Cosmos-like Bidens Bigelovii was frequent in the shade. Trixis angustifolia bushes were seen now and then. Zinnia pumila was frequent. Porophyllum macrocephalum was rare. Eupatorium incarnatum grew in the woods. Parthenium incanum, the rubber plant, Guayule, was found now and then on the plain. There were a few goldenrods and asters. Brickellia Rusbyi occurred now and then, a shrub. Gymnolomia multiflora was frequent. An interesting plant was Eupatorium solidaginfolium. Another puzzling plant that looked so much like a sunflower was Tithonia Thurberi.

The mountain was clad half way up with live oaks which came down to the lower levels only in the canons. The farther one went up the mountain the less interesting the flora became. The luxuriance of the mesa flora was very great, and it was clearly Mexican.

It was my intention to go to the top of this range before I left the region, after I had gone over the mesa flora thoroughly. So I pulled out, intending to go up the second canon as far as possible with my car, and then camp and go afoot from there. I had taken one trip horseback to the first big canon south of the station, and had reached water and the lower mountain flora, but it was a very hard trip to make. So I pulled out in the morning and drove toward Pawi, expecting to find some road cutting off, but there was only one going to the first canon. So I went to Pawi and there was informed that a road went through the brush in that direction. So I explored and finally, after trying two, I took one that led me far out toward the mountain through the brush. On the way I got several interesting species. Then the road, after cutting across an impossible wash, was turned north and finally merged in the road on which I came out in the morning. So I decided not to waste any more time, and struck out for Sells and Tucson, and on the way was drenched by another terrific rainfall. I spent a day at Tucson repairing a spring and drying out. Then struck out for the Huachuca mountains some 80 miles southeast near Tombstone. On the way the Yuccas were much in evidence, the tree-like elata and the lower macrocarpa. The latter was manifestly different from our Mohavensis in the fine threads near the base of the leaves, and in the variation in the thickness which was verging toward Schottii, but the difference between it and Schottii was not as marked as one would wish. On the higher mesas I found a Juniperus that was not Californica nor Utahensis, for the bark was more that of Virginiana except that of the twigs which were not cross-cracked or reddish. I had to assume that this was J. occidentalis. I knew it could not be pachyphloea. As I approached Benson there was much less shrubbery and more grass, and the region was far more prairie-like than westward, in fact it was a great prairie. The presence of Bouteloua trifida and apparently oligostachya was a contributing factor. At this place there came in a Lepidium Thurberi which was quite marked because of the pearly white flowers. By the roadside was the ubiquitous Salvia lanceolata, Hymenatherum pentachaetum, the Mexican Flaveria repanda, Ambrosia trifida. This is what Gray calls the var.

Texana but it does not seem to warrant varietal rank. There was also Verbesina Wrightii and Gymolomia multiflora.

After collecting some at Benson and along the way, I reached the malodorous Tombstone, of the long ago. It is now a rambling shack of a town, inhabited by left-overs mostly, and with nothing to remind you of its "glory" in the days of noise and bluster, saloons and fast women. Prohibition has taken the starch out of many an old time moral eyesore among the towns of Arizona, and made them more or less decent though dilapidated. From here the road, a one-track wagon road, ambles over the hills, and down to another famous old place, Charleston, along the river on the edge of the valley. It is now mostly one house and a few shacks, its glory having departed. Then as one slips along the road over the vast plain, he is taken back in his imagination to the beautiful prairies of Iowa two generations ago, where as far as the eye can reach is grass and beautiful flowers. The great north end of the Huachucas looms to the south and the various canons begin to take shape, Miller, Cass and Ramsey canons. Miller canon is the largest and is a great ampitheater with nearly vertical walls at the south which rise up into the Pine belt above the live oaks. Cass Canon is a short and obscure one just to the west of Miller, and then comes Ramsey Canon, a winding and rather steep gulch going up to the very crest of the range, and having a beautiful stream of water flowing its entire length. This is where Lemmon, some 35 years ago, spent a month botanizing and collected a number of new species, and quite a number of Mexican plants not known to exist in the U. S. before. Some 34 years ago I spent a week at Fort Huachuca, which lies among the live oaks on the lower flanks of the range and some 20 miles farther south, but I did not get into Ramsey Canon. I have always desired to get into this particular canon, but never had the opportunity before.

There were ranches scattered over the plain, and several summer residences were found along the creek as I rambled up and out of the plain into the sycamores and walnuts and willows and cottonwoods that lined the creek. At last, several miles up, I came to James's resort, where there is an orchard and summer cottages embowered in shade. Just beyond is Brenner's, another resort, among the live oaks. The elevation was 5,500 feet above the sea, but still in the Tropical life zone. The wealth of flowers was even greater than in the Baboquivori, and decidedly different th many ways. At my back door was Delphinium scopulorum growing vigorously and three feet high. Near by was Erigeron Philadelphicus, also in the shade of the trees along with the splendid Cacalia decomposita, and the equally beautiful Senecio Hartwegi, the latter reminding one of the Mexican species. These were not the scrawny things one would expect in the hot regions but ample and luxuriant species. Across the stream and on drier slopes but under the shade of trees grew Yucca Schottii, just as it does in Lower California at the Cape. It is the only Yucca that grows in the shade of other trees. The trunks are usually six feet high but sometimes reach eight feet, and are covered with the reflexed leaves which are often nearly three feet long, glacuous-green, flattish, contracted below,

rather flabby and without threads, or with a few near the base which are fine and not coarse as in baccata. The panicles are sessile, about as long as the leaves, and the fleshy pear-like fruit is about half a foot long and three inches wide and with conspicuous and edible outside pulp, and pendent. It is seldom that any ripe fruit is seen for they are perforated in many places by worms. Growing along with it, but mostly in the sun, is an Agave of the Americana type. On the ground in the open places were many annuals such as Panicum sanguinale, Aegopogon Acalypha Neo-Mexicana, Chenopodium botrys, Monnina Wrightii, Euphorbia dentata, Phaseolus tenuifolius, Crotalaria lupulina, Houstonia angustifolia, Crusea sublate, Cuphea Palmeri, Linum Neo-Mexicanum, Schkuhria Wrightii, Valeriana sorbifolia, Carminatia tenuiflora, Galinsoga parviflora, Apolopappus gracilis, and the last Centaurea Americana appearing as if introduced.

Among the perennials at 5,500 feet altitude the most common grass was Panicum bulbosum, growing in large clumps. Setaria glauca was introduced, as was Sonchus oleraceus. One of the most striking grasses was Agropyron Arizonicum, often 6 feet high and growing in small tufts. Andropogon chrysocoma and furcatus were common. So was Epicampes distichophylla and macroura. Erogrostis lugens and pilosa, Orizopsis micrantha, Commelyna dianthifolia, Cyperus Schweinitzii, Salix taxifolia, Quercus hypoleuca and grisea, Acalypha Lindheimeri, Tragia nepetifolia and ramosa, Oxalis amplifolia, Erigonum annuum, and Wrightii, Silene laciniata, Sisymbrium Vaseyi, Draba petrophila, Berberis Wilcoxi, Euphorbia flagelliformis, Argythamnia Neo-Mexicana, Calliandra eriophylia, Desmodium Arizonicum. Bigelovii, Grahami. Tephrosia leucantha, Lupinus ampulus, and Palmeri, Philadelphius argenteus, Cercocarpus brevifolius, Rubus rubricaulis and ursinus, Agrimonia striata, Heuchera sanguinia, Gaura parviflora, and gracilis, Aralia bicrenata, Galium Rothrockii, Gentiana Wrightii, Ipomoea hederifolia, and cardiophylla, Geranium Carolinianum, Acer grandidentatum, Agastache Mearnsii, Hedeoma oblongifola, Pentstemon barbatus, Mimulus cardinalis, Verbena hastata, Fraxinus attenuata, Arbutus Arizonica, Gila aggregata, Lobelia cardinalis, Heterospermum pinnatum. Hieracium Fendleri, Perityle coronopifolia, Tagetes Lemmoni, Carminatia tenuiflora, Rudbeckia lacinata, Stevia Plummerae, Eupatorium Arizonicum, Erigeron Neo-Mexicana, Xanthocephalum Wrightii, Brickellia venosa, reniformis, grandiflora, chenopodina, floribunda, Rusbyi, Encelia exarata, Senicio Hartwegi, Verbesina longifolia, Heliopsis parvifolia.

About half a mile above James's place the creek enters a canon which is a real box, several hundred feet deep and about 100 yards long and about 6 feet wide. On the rocks of this canon grow Draba petrophila and Perityle coronopifolia. Just as one gets out of the upper end of the box he comes into luxuriant flora of herbs and shrubs. It is here on the steep slopes where the ferns abound. Almost the entire surface, including the loose rocks, have ferns peeping out from every nook. Here I found Polypodium thysanolepis, which at first looks like the dwarf form of vulgare, but the under surface is clad with scales. Here and there is a long stalk

of Notholaena sinuata. There are large patches of N. Hookeri. Under almost every rock are long lines of Cheilanthes tomentosa and Fendleri and among these plants grow Pellaea marginata, which forcibly reminds one of C. Californica. One does not wonder that it was placed in Cheilanthes. Then scattered through the mass is the remarkable Pomatophytum. Following up the canon a few miles we come to permanent cliffs of limestone or quartzite in whose crevices I found Asplenium Trichomanes, which is about half way between true Trichomanes and the var. incisum which Maxon has called vespertinum. Here also I found Cheilanthes Fendleri. Along the roadside I also found, near a slip, a single specimen of Achroanthes porphyrea. It looks almost like the twablade. The farther up the canon I went the less interesting the flora became. All along were scattered Centaurea Americana, acting just like an introduced plant.

It is manifest from the trails that the mountains have been the resort of men for ages. Such running water could never be neglected, in this waterless region, by the aborigines.

The canon is steep above James's and hard to negotiate, but at one time there was a wagon road up it for miles, the track being washed out above James's place now. It is evident that this range was for long a great rendesvouz for Apache Indians, and led to the establishment of Fort Huachuca, 20 miles south, on the flanks of the range. Now every little spring and stream is appropriated by ranchers and we see cultivated fields.

It may not be well known that Arizona and New Mexico are subject to a conspicuous summer rainfall, beginning in June and ending in September. This is a continuance of the rainy season of Mexico, and it feathers out near the Grand Canon. It does not seem to extend quite to Yuma but goes as far as Ajo. This was the reason for my visit in the middle of the very hot summer, when all California was as dry as could be.

The matter of life zones is paramount with me, and I try to get a clearcut idea of the zones in every region that I visit. Throughout most of Arizona and New Mexico there is no question of the limits of the zones because one only has to observe the presence of Larrea to know that it is Tropical. But after certain elevation is reached we come into the belts of live oaks where the flora changes somewhat and one is led to think that they represent the Juniper (Lower Temperate) zone. But in checking up I find that what seems like the Tropical continues entirely through this belt at least to an elevation of 6,500 feet altitude in the Huachucas and Baboquivoris. In the north end of the Huachucas the trouble is accentuated by the ravines and heavy growth of timber, permitting forms to grow in suitable places that are manifestly Middle Temperate, such as Delphinium scopulorum, Brickellia grandiflora, etc. Pinus Chihuahuana and Pinus cembroides are scattered through the live oaks. The first pine is manifestly an ally to Sabiniana, which grows in California in the upper Tropical. But the second is not like any northern species and cannot be compared with edulis and monophylla, as has been done by others. I did not get higher than 6,500 feet altitude in the Huachucas, and therefore am not prepared to say what are the limits of the upper zones.

After getting most of the flora at Ramsey Canon I pulled out for home, but went over to Miller Canon and did a little botanizing there. There I found Notholaena ferruginea and Hookeri, Cheilanthes myriophylla, Elionurus barbiculmis, Cyperus Schweintzii, Gomphrena caespitosa, Mollugo cerviana, Sisymbrium Vaseyi, Amorpha ovalis, Zinnia grandiflora, Perezia nana on the mesa below Miller Canon and clearly a perennial. Also along the roadside I found Heterotheca subaxillaris.

Returning to Tucson the way I went I then turned off toward Phoenix, passing through Sacaton, by way of Picacho Pass. I found a few things along the road. Then I passed on over to the Hassayampa and followed up it to Wickenburg. But there was little of interest there because of the lack of rain. West of Wickenburg on the hills I saw growing, just as Holacantha does in California, the rare shrub Canotia holacantha. It was in full fruit. This ended my botanizing on the trip.

LIST OF 1929 PLANTS

Mosses. 24663 Benson under junipers. 9-27, 1929. Arizona.
24664 Ramsey Canon, Huachuca mountains. 9-29, 1929. In forests of live oaks.
24665 Ramsey Canon, Huachuca mountains, Arizona. 9-30, 1929. In live oaks.
24666 Ramsey Canon, Huachuca mountains, Arizona. 9-29, 1929.

Equisetum laevigatum. 24667 Ramsey Canon. 9-28,1929. Along creek in swampy places, in timber, Huachuca mountains, Arizona.
24668 Same. 9-28, 1929. Same locality.

Abies concolor 24669 Ramsey Canon, Huachuca mountains. 9-30, 1929. 6,000 feet altitude. This is the only fir, and is common.

Juniperus pachyphloea 24671 Ramsey Canon, Huachuca mountains, Arizona. 9-26-1929. A symmertical tree, with oak-like bark, and somoth twigs.

Juniperus occidentalis var. monosperma. West of Benson, Arizona. 9-27, 1929. Among the creosote bushes. A small tree, 10-15 feet high, and bushy, with close bark in long layers, but not shredding up as in Utahensis. The larger twigs smooth. Branches from the ground. No. 24670.

Pinus cembroides. 24672 Ramsey Canon, Arizona. 9-28-1929. The sheaths of this species are very short.

Pinus cembroides as given above does not seem to me to be very near to P. edulis, nor do edulis and monophylla seem to me to be varieties of it. The general habit of the tree is like them, but the leaves are nearer those of Chihuahuana. They have the same deciduous sheaths and slenderness though less than half as long, and are in threes, not twos as in edulis.

Pinus Chihuahuana. No. 24673. Among the live oaks near the upper edge of the Tropical life zone, on slopes. This plant has almost exactly the habit of Pinus Sabiniana. The foliage has the same airy tint and appearance, being relatively sparse and glaucous. The leaves are mostly 3, rarely 2 or 4, and 2 cm. long by ½ mm. wide, with the outer surface very convex and the inner very concave and with a prominent central nerve, with tip very sharp. The blades are flexuous and soft and widely spreading. The cones resemble in a general way those of flexilis but only half as long. The sheaths are very thin and lacerate-fibrous on the margins and chestnut-colored. The trees are like those of P. Murrayana, straight and tall. Ramsey Canon, Huachuca mountains. September 29, 1929. Cones hang on for some years.

I collected all the ferns I saw growing except the Brake, which was common at upper elevations.

Polypodium thysanolepis. This unique Mexican fern, first got by Lemmon in the same region in the U. S., makes one think the moment he sees it that he has found the ubiquitous vulgare, for it has the same habit

and size of the reduced form found in the Wasatch mountains, Utah. But its scaly under surface and single row of big sori differ. The scales are dull chestnut-colored and acuminate and lacerate and conspicuously depressed appressed below, and mostly have the appearance of being an indusium for the fruit dots as well as detached scales. Ramsey Canon, on rocks in crevices among the live oaks. No. 24674. September 28, 1929.

Asplenium Trichomanes. No. 24675. Ramsey Canon, Huachuca mountains. September 30, 1929. Rather common on rocks among the live oaks. The form of this species, common, here is more like that of the east than of California and western Mexico, which Moore called var. incisum and which Maxon has raised to specific rank under the name of vespertinum. I cannot see any good reason for making a species of it.

Pellaea atropurpurea. No. 24676. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929. On rocks along with Cheilanthes. In shady places.

Cystopteris fragilis. No. 24667. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929. I think Christensen was right in reducing Underwood's Filix, which was a resurrection of Adanson's genus Filix, which never had any species attached till after Bernhardi created Cystopteris. This species is rather common on slopes and around springs, and reaches nearly 2 feet in hight. It is one of the prettiest of the ferns. I also saw it in the Baboquivori mountains, but did not collect it.

Woodsia Mexicana. No. 24678. Ramsey Canon, Huachua mountains, Arizona. September 28, 1929. Common among loose rocks on slopes, and with the habit of Cystopteris, but growing in more open places. This has the common characteristic of all the other Woodsias that I know, that of being pruinosely puberulent throughout, and which is about the only means of determining which genus it is without recourse to the microscope. This species is quite variable and may run into W. obtusa (W. Plummerae). The indusium is conspicuous always, ending in long hairs.

Notholaena ferruginea. No. 24679. Miller Canon, Huachuca mountains, Arizona, October 1, 1929. In crevices of rocks in open places. Tropical. This is a very pretty fern, growing in dense tufts because of the shortly branching rootstocks. The rootstocks and lower stalks have dark-chestnut, hair-like scales in addition to the somewhat woolly hairs which cover the whole plant, and which are silvery white at first. The fronds often become 2 feet long, but rarely over 2 inches wide, and taper to the tip, and are very unlike any other species. Also No. 24680. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Notholaena sinuata. No. 24681. Baboquivori mountains, Arizona. September 20, 1929. In open places among rocks and in crevices.

Notholaena Hookeri. No. 24682. Miller Canon, Huachuca mountains,

Arizona. October 1, 1929. Also No. 24683. Baboquivori mountains, Arizona. September 19, 1929. In open places, Tropical, growing in large areas and spreading from underground rootstocks.

Pellaea marginata. No. 24684. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929. Growing along with Cheilanthes myriophylla and Alabamensis on slopes among loose rocks in open places. Tropical. This is the most interesting of all the Arizona ferns because of its rarity and uniqueness. It reminds one at once of Cheilanthes Californica, and has much the same habit. One does not wonder that it was placed in Cheilanthes. It has no place in Pellaea. It also reminds one of Cryptogramma acrostichoides and Stelleri.

Cheilanthes myriophylla. No. 24685. Miller Canon, Huachuca mountains, Arizona. This is the most common of all the ferns, growing among loose rocks and in crevices along with Fendleri, and is conspicuous among the species of Cheilanthes through its rusty-colored scales and tomentum. Tropical. It is very variable and probably includes Lindheimeri.

Cheilanthes Lindheimeri. No. 24686. Baboquivori mountains, Arizona. September 19, 1929. In open places among rocks and in crevices. Very common. Tropical.

Cheilanthes tomentosa. No. 24687. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929. On slopes among loose rocks and in crevices. Tropical.

Cheilanthes Fendleri. No. 24688. Ramsey Canon, Huachuca mountains, Arizona. Seeptember 29, 1929. In crevices of rocks. Tropical.

Cheilanthes microphylla. No. 24689. Baboquivori mountains, Arizona. Seeptember 20, 1929. This seems quite common in crevices of granite rocks. Tropical. It has the habit of lanuginosa. (Feei.)

Pomataphytum pocillatum. New Genus. Allied to Cheilanthes tomentosa, but with the habit of C. Fendleri. Fronds smooth above and green, 6-8 inches long, the stalk being half the whole, the whole frond below being covered with nearly straight chestnut-colored tapering hairs, which at the very base of stalk turn into narrow scales, the pinnules are destitute of hairs or scales except along the midrib are hairs. Fronds lanceolate in outline, tapering slightly below and much above, tripinnate, with pinnae about 10 pairs, the pinnules about 8 pairs and the final segments about 4 pairs in the middle of the pinule, and obovate and with the final one twice as long and often panduriform and mostly stalked. Indusium forming a complete pocket, open only below, which is separated from the margin of the frond by half its width and arises from the surface of the frond and not from the margin as in tomentosa. This white membrane gives the fronds a white appearance as if very pubescent. The fronds are more delicate than tomentosa. Growing in crevices of rocks and under stones above the box in Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929. Final segments coarsely crenate. No. 24690.

Also No. 120549. Pomona College herbarium, got by me at Guayanopa Canon, Chihuahua, September 24, 1903, at 3,600 foot altitude, in Tropical life zone on slopes. At first sight this fern seems to be Cheilanthes tomentoa or Fendleri, and grows with them but the indusium is entirely different and fills the whole of the pinnule, giving the young fronds a silvery appearance.

Notholaena tenera. Cheilanthes Jonesii Maxon. An examination of young material shows a distinct indusium, and this would place it in Cheilanthes. But to me the plant is as good a species of Pellaea as Notholaena. I do not know N. tenera and so do not know if Maxon's species is a good one or not. The species of ferns of the deserts and of southern California are in a bad state of confusion.

An examination of various material convinces me that Maxon's Cheilanthes siliquosa is not a good species; it is too near to California, and has intergrades. The same is true fo his Covillei, for it cannot be separated from Fendleri by any good character.

Cheilanthes Alabamensis certainly is a good Pellaea as Baker put it long ago. In the same class belong several Mexican species of Cheilanthes which are too near to Pellaea.

Cheilanthes gracillima was got by Baker at St. Croix Falls, Wisconsin, July 5, 1900, and is No. 23324, Pomona College Herbarium.

Panicum colonum. No. 24691. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929. No. 24692. Boboquivori mountains, Arizona. September 19, 1929. Waste places.

Panicum hirticaule. No. 24693. East of Desert Center, California. September 16, 1929. Common along with Pectis.

Panicum Hallii. No. 24694. Baboquivori mountains, Arizona, September 23, 1929.

Panicum bulbosum var. sciaphilum. No. 24695. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929. On hillsides, very common, and in the valley below.

Setaria caudata. No. 24696. Baboquivori mountains, Arizona. September 20, 1929. Perennial.

Setaria caudata var. pauciflora (Vassey) as Chaetochloa. No. 24697. Ajo, Arizona. September 18, 1929. No. 24698. Baboquivori mountains, Arizona. September 19. 1929. Common.

Setaria glauca. No. 24699. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929. In waste places.

Panicum sanguinale L. No. 24700. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929. Annual.

Fern Notes Additional

Agropyron Arizonicum Scr. & Merr. No. 24701. Ramsey Canon, Huacuca mountains, Arizona, at 6,000 feet altitude, among the live oaks. September 30, 1929. This plant is rather unique. It is 4-6 feet high and erect but very slender, and with wand-like linear spikes and glaucous leaves. It is not stoloniferous but grows in small tufts of a few stems, and in open places. The glaucousness varies greatly.

Bromus marginatus. No. 24702. Arrowhead Lake, California, August 4, 1929.

Bromus Richardsonii. No. 24703. September 29, 1929. Ramsey Canon, Huachuca mountains, Arizona. Common.

Andropogon contortus. No. 24704. Baboquivori mountains, Arizona.

Andropogon chrysocomus. No. 24705. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929. On prairies. No. 24706. Miller Canon, same region, October 1, 1929. Baboquivori mountains, Arizona. September 20, 1929.

Andropogon furcatus. No. 24708. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Elionuris barbiculmis. No. 24709. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.

Trachypogon Montufari. No. 24710. Ramsey Canon, Huachuca mountains, Arizon. September 30, 1929.

Andropogon saccharoides. No. 24711. Baboquivori mountains, Arizona. September 19, 1929.

Andropogon cirrhatus (?). No. 24712. Ajo, Arizona. September 18, 1929. Along creek bottom. Same as 22812 from Nogales. Rachis smooth.

Aegopogon geminiflorus var. unisetus. No. 24713. Ramsey Canon, Huachucha mountains, Arizona. September 29, 1929. Along roadside. A very delicate annual. Very poorly drawn in Beal's Grasses and in Grasses of the Southwest, p. 1, v. 12. It is clearly close to Hilaria.

Pappophorum apertum. No. 24714. Ajo, Arizona. Sept. 18, 1929. In dry wash. No. 24745. Baboquivori mountains. September 22, 1929.

Bouteloua polystachya. No. 24715. Ajo, Arizona. September 18, 1929. No. 24716. Hayfields, west of Desert Center, California. September 16, 1929. No. 24717. East of Desert Center. September 16, 1929. Common on flats. No. 24719. Sentinel, Arizona. September 18, 1929. No. 24724. Benson, Arizona. September 27, 1929.

Boutelous trifida. No. 24717. Benson, Arizona. September 27, 1929.

Boutelous bromoides. No. 24718. Baboquivori mountains, Aoizona. September 19, 1929.

Bouteloua racemosa. No. 24720. Baboquivori mountains, Arizona. September 19, 1929. Common.

Bouteloua aristidoides. No. 24721. Hayfields, west of Desert Center, California. September 16, 1929. No. 24722. Ajo, Arizona. September 18, 1929. No. 24723. Benson, Arizona. September 27, 1929.

Bouteloua oligostachya (?) No. 24725. Benson, Arizona. September 27, 1929. Everywhere.

Boutelous hirsuta. No. 24726. Baboquivori mountains, Arizona. September 20, 1929. Very common.

Leptochloa dubia. No. 24727. Baboquivori mountains, Arizona. September 20, 1929.

Leptochloa mucronta. No. 24728. Sells, Arizona. September 18, 1929.

Muhlenbergia debilis. No. 24729. Arrowhead Lake, California. August 4, 1929.

Cassia nictitans. No. 24884. Baboquivori mountains, Arizona. September, 19, 1929.
Cassia Covesii. No. 25021. Picacho Pass. October 2, 1929.
Erythrina flabelliformis. No. 24885. Baboquivori mountains, Arizona. September 19, 1929.
Desmanthus Jamesii. No. 25024. Baboquivori mountains, Arizona. September 22, 1929.
Hosackia Purshiana. No. 24886. Arrowhead Lake, California. August 4, 1929.
Trifolium involucratum. No. 24887. Tioga Pass, California. June 30, 1929. No. 24900. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Calliandra humilis. No. 25020. Sells, Arizona. September 18, 1929. No. 24888. Baboquivori mountains, Arizona. September 20, 1929.
Calliandra eriophylla. No. 24889. Baboquivori mountains, Arizona. September 20, 1929. No. 24890. Ramsey Canon, Huachuca mountains,
Eysenhardtia orthocarpa. No. 24891. Baboquivori mountains, Arizona. September 29, 1929.
Hoffmanseggia drepanocarpa. No. 24892. East of Desert Center, California. September 16, 1929.
Cologania longifolia. No. 24893. Baboquivori mountains, Arizona. September 19, 1929.
Phaseolus acutifolius. No. 24894. Baboquivori mountains, Arizona. September 23, 1929.
Phaseolus tenuifolius. No. 24895. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929. No. 25023. Baboquivori mountains, Arizona. September 19, 1929.
Phaseolus macropoides. No. 24896. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.
Dalea Parryi. No. 24897. Ajo, Arizona. September 18, 1929.
Dalea Grayi. No. 24898. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.
Dalea formosa. No. 25026. Baboquivori mountains, Arizona. September 19, 1929.
Crotalaria lupulina. No. 24899. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.
Amorpha ovalis N. Sp. No. 25027. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.
Desmodium Arizonicum. No. 24901. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Desmodium batocaulon. No. 24902. Baboquivori mountains, Arizona. September 19, 1929.
Desmodium Metcalfi. No. 24903. Baboquivori mountains, Arizona. September 19, 1929.
Desmodium Bigelovii. No. 24904. Baboquivori mountains, Arizona. September 23, 1929. No. 24905. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Desmodium Neo-Mexicanum. No. 24906. Ramsey Canon, Huachuca mountains, Arizona. September 27, 1929. No. 25022. Baboquivori mountains, Arizona. September 24, 1929.

Desmodium Grahami. No. 24907. Ramsey Canon, Huachuca mountains, Arizona. September 20, 1929.

Lupinus Andersonii. No. 24908. Tioga Pass, California, June 30, 1929. Mono Lake, California. June 29, 1929. No. 24910. Bear Lake, California. August 7, 1929.

Tephrosia leucantha. No. 24933. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Lupinus Palmeri. No. 24911. Ramsey Canon, Huachuca mountains. September 28, 1929.

Lupinus amplus. No. 24912. Ramsey Canon, Huachuca mountains, Arizzona. September 28, 1929.

Zornia diphylla. No. 25025. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.

Philadelphus argenteus. No. 24913. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Philadelphus microphyllus. No. 23914. Baboquivori mountains, Arizona. September 23, 1929.

Potentilla gracilis. No. 24915. Arrowhead Lake, California. August 4, 1929.

Cercocarpus brevifolius. No. 24916. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Chamaebatia foliolosa. No. 24917. Tioga Pass, California. June 30, 1929.

Rubus rubricaulis (W. & S.) No. 24918. Ramsey Canon, Huachuca mountains. September 30, 1929.

Rubus ursinus. No. 24919. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Agrimonia striata. No. 24920. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Heuchera sanguinea. No. 24921. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Krameria glandulosa. No. 24922. Castle Dome, Arizona. September 17, 1929.

Dodonaea viscosa var. angustifolia. No. 24923. Baboquivori mountains, Arizona. September 19, 1929.

Ayenia pusilla. No. 24924. Baboquivori mountains, Arizona. September 20, 1929.

Sphaeralcea angustifolia. No. 23925. Benson, Arizona. September 17, 1929.

Ingenhouzia triloba. No. 24926. Baboquivori mountains, Arizona. September 23, 1929.

Abutilon Texense. No. 24927. Baboquivori mountains, Arizona. September 23, 1929.

Abutilon malacum. No. 24930. Baboquivori mountains, Arizona. Sep-

tember 19, 1929.
Sida crispa. No. 24928. Baboquivori mountains, Arizona. September 19, 1929.
Sida Neo-Mexicana. No. 24929. Baboquivori mountains, Arizona. September 22, 1929.
Janusia Californica. No. 24931. Baboquivori mountains, Arizona. September 22, 1929.
Janusia gracillis. No. 24932. Baboquivori mountains, Arizona. September 20, 1929.
Argemone hispida. No. 24933. Mono Lake, California. June 29, 1929.
Houstonia angustifolia. No. 24934. Ramsey Canon, Huachuca mountains, Arizona. Seeptember 30, 1929.
Gayophytum ramosissimum. No. 24935. Arrowhead Lake, California. August 4, 1929. No. 24937. Cushenbury Grade. August 4, 1929.
Epilobium paniculatum var. jucundum. No. 24936. Arrowhead Lake, California. August 4, 1929.
Epilobium adenocaulon. No. 24938. Arrowhead Lake, California. August 4, 1929.
Epilobium glaberrimum. No. 24940. Arrowhead Lake, California. August 4, 1929.
Boisduvalia densiflora. No. 24939. Arrowhead Lake, California. August 4, 1929.
Gaura parviflora. No. 24941. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.
Oenothera biennis. No. 24942. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Gaura gracilis. No. 24943. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Aralia bicrenata. No. 24945. Ramsey Canon, Huachuca mountains, Arizona. Seeptember 29, 1929. This is very near to A. racemosa.
Sium lineare. No. 24948. Bluff Lake, California. September 2, 1929.
Carum Kelloggii. No. 24950. Arrowhead Lake, California. August 4. 1929.
Pseudocymopterus tenuifolius. No. 24951. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Podosciadium capitellatum. No. 24947. Bluff Lake, California. September 2, 1929.
Sanicula lacinata. No. 24946. Arrowhead Lake, California. August 4, 1929.
Galium Rothrockii. No. 24952. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Galium Aparine. No. 24953. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.
Echinocactus Lecontei (?). No. 24954. Baboquivori mountains, Arizona. September 20, 1929.
Echinocactus acanthodes. No. 24955. Baboquivori mountains, Arizona. September 25, 1929.

Opuntia leptocaulis. No. 24956. Benson, Arizona. September 27, 1929.
Petalonyx Thurberi. No. 24957. Ajo, Arizona. September 18, 1929.
Crusea subulata. No. 24958. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Apodanthera rigida. No. 24959. Baboquivori mountains, Arizona. September 20, 1929.
Echinopepon Wrightii. No. 24960. Baboquivori mountains, Arizona. September 22, 1929.
Larrea Mexicana. No. 24961. Benson, Arizona. September 27, 1929.
No. 24965. Quartzite, Arizona. September 17, 1929.
Tribulus grandiflorus. No. 24962. Sentinel, Arizona. September 18, 1929.
Tribulus maximus. No. 24963. Hayfields, west of Desert Center, California. September 16, 1929.
Holacantha Emoryi. No. 24964. Hayfields, west of Desert Center, California. September 16, 1929.
Hibiscus denudatus. No. 24966. Baboquivori mountains, Arizona. September 20, 1929.
Gentinana Wrightii. No. 24967. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Malvastrum orbiculatum. No. 24968. Cushenbury grade, San Bernardino mountains, California. August 4, 1929.
Physalis Wrightii. No. 24969. Baboquivori mountains, Arizona. September 22, 1929.
Physalis lobata. No. 24970. Baboquivori mountains, Arizona. Septembeer 27, 1929.
Capsicum baccatum. No. 24971. Baboquivori mountains, Arizona. September 19, 1929.
Ipomoea hederifolia. No. 24972. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.
Ipomoea Lindheimeri. No. 24973. Baboquivori mountains, Arizona. September 19, 1929.
Ipomoea costellata. No. 24974. Baboquivori mountains, Arizona. September 22, 1929.
Ipomoea cardiophylla. No. 24975. Baboquivori mountains, Arizona. September 22, 1929. No. 24976. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.
Evolvulus linifolius. No. 24977. Baboquivori mountains, Arizona. September 19, 1929.
Evolvulus argenteus. No. 24978. Benson, Arizona. September 27, 1929.
Cuscuta Californica (?). No. 24979. Mohawk, Arizona. September 18, 1929.
Cuscuta curta. No. 24980. Baboquivori mountains, Arizona. September 9, 1929. No. 24981. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.
Cuscuta umbellata. No. 24982. Sentinel, Arizona. September 18, 1929.
Geranium Carolinianum. No. 24983. Ramsey Canon, Huachuca mountains, Arizona. September 19, 1929.

Acer grandidentatum. No. 24984. Ramsey Canon, Huachuca mountains. Arizona. September 29, 1929.
Sphaeele calycina. No. 24985. Near Santa Barbara. June, 1929.
Salvia lanceolata. No. 24986. Benson, Arizona. Seeptember 27. 1929.
Agastache Mearnsii. No. 24987. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Monarda tenuiaristata. No. 24988. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.
Cuphea Palmeri. No. 24989. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Scutellaria antirrhinoides. No. 24890. Baldwin Lake, California. August 17, 1929.
Monardella lanceolata. No. 24991. Temecula Bridge, California. July 13, 1929.
Monardella linoides. No. 24992. Baldwin Lake, California. August 17, 1929.
Hedeoma oblongifolia. No. 24933. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Verbena perennis. No. 24994. Baboquivori mountains, Arizona. September 19, 1929.
Castilleia linearifolia. No. 24995. Cushenbury Spring, San Bernardino mountains, California. September 17, 1929.
Castilleia miniata. No. 24996. Ramsey Canon, Huachuca mountains. Arizona. September 30, 1929.
Castilleia parviflora. No. 24997. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Pentstemon barbatus var. labrosus. No. 24988. Arrowhead Lake, California. August 4, 1929. No. 25010. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Mimulus cardinalis. No. 24999. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Scophularia Californica. No. 25000. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.
Ruellia tuberosa var. occidentalis. No. 25001. Baboquivori mountains, Arizona. September 19, 1929.
Ruellia Parryi. No. 25002. Baboquivori mountains, Arizona. September 19, 1929.
Tetramerium hispidum. No. 25003. Baboquivori mountains, Arizona. September 22, 1929.
Diclipetra Torreyi. No. 25004. Baboquivori mountains. Arizona. September 20, 1929.
Apocynum pumilum. No. 25005. Arrowhead Lake, California. August 4, 1929.
Verbena hastata. No. 25006. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Linum Neo-Mexicanum. No. 25007. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Fraxinus attenuata. No. 25008. Ramsey Canon, Huachuca mountains, Arizona. Seeptember 30, 1929.

Plumbago scandens. No. 25009. Baboquivori mountains, Arizona. September 19, 1929.

Arbutus Arizonica. No. 25019. Ramsey Canon, Huachuca mountains, Arizona. Seeptember 30, 1929.

Coldenia Greggii. No. 25018. Castle Dome, Arizona. September 17, 1929.

Gilia aggregata. No. 25017. Ramsey Canon, Huachuca mountains, Arizona. Seeptember 28, 1929.

Gilia intertexta. No. 25016. Cushenbury Grade, San Bernardino mountains, California. August 17, 1929. No. 25015. Bear Lake, California. August 17, 1929.

Gilia androsacea. No. 25013. Baldwin Lake, California. August 17, 1929.

Cryptantha micrantha. No. 25014. Baldwin Lake, California. August 17, 1929.

Heliotropium Curassavicum. No. 25012. Baldwin Lake, California. August 17, 1929.

Lobelia cardinalis. No. 25011. Ramsey Canon, Huachuca mountains, Arizona. Seeptember 30, 1929.

Boerhaavia erecta. No. 24796. Hayfields, west of Desert Center, California. September 16, 1929.

Boerhaavia intermedia. 24797. Baboquivori mountains, Arizona. September 19, 1929.

Boerhaavia Coulteri. No. 24798. Hayfields, west of Desert Center, California. September 16, 1929.

Boerhaavia Wrightii. No. 24799. Hayfields, west of Desert Center, California. September 16, 1929.

Boerhaavia scandens. No. 24800. Baboquivori mountains, Arizona. September 19, 1929.

Allionia melanotricha. No. 24801. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Abronia villosa. No. 24802. Temecula Bridge, California. July 13, 1929.

Gomphrena nitida. No. 24803. Baboquivori mountains, Arizona. September 20, 1929.

Gomphrena caespitosa. No. 24804. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.

Rivina portulaccoides. No. 24805. Baboquivori mountains, Arizona. September 19, 1929.

Amarantus Torreyi. No. 24806. Castle Dome, Arizona. September 17, 1929.

Amarantus retroflexus. No. 24807. Miller Canon, Huachuca mountains, Arizona. September 29, 1929.

Iresine celosioides. No. 24808. Baboquivori mountains, Arizona. September 23, 1929.

Chenopodium Fremonti. No. 24809. Miller Canon, Huachuca mountains, Arizona. September 29, 1929.

Chenopodium Botrys. No. 24810. Miller Canon, Huachuca mountains,

Arizona. September 29, 1929.
Atriplex saccaria. No. 24811. Baldwin Lake, California. August 17, 1929.
Atriplex Greggii. No. 24812. Sacaton, Arizona. Otcober 2, 1929.
Atriplex expansa. No. 24813. Mohawk, Arizona. September 17, 1929.
Atriplex canescens. No. 24814. Mohawk, Arizona. September 17, 1929.
Mollugo Cerviana. No. 24815. Miller Canon, Huachuca mountains, Arizona. October 1, 1929. Benson, Arizona. September 27, 1929.
Triamthema portulaccoides. No. 24817. East of Desert Center, California. September 16, 1929.
Oxalis amplifolia. No. 24818. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Alternanthera lanuginosa. No. 24819. East of Blythe, along the Colorado river, Arizona. September 16, 1929.
Alternanthera suffrutescens. No. 24820. Welton, Arizona. September 17, 1929.
Eriogonum ovalifolium (?). No. 24821. Baldwin Lake, California. August 17, 1929.
Eriogonum Wrightii. No. 24822. Baboquivori mountains, Arizona. September 23, 1929. No. 24823. Miller Canon, Huachuca mountains, Arizona. No. 24824. Ramsey Canon. September 27, 1929.
Eriogonum cernuum. No. 24825. Baldwin Lake, California. August 17, 1929. No. 24826. Cushenbury Spring, Arizona. August 17, 1929. No. 24827. Mohawk, Arizona. September 17, 1929. No. 24828. Benson, Arizona. September 27, 1929.
Eriogonum gracile. No. 24829. Bear Lake, California. August 17, 1929.
Polygonum Douglasii. No. 24844. Arrowhead Lake, California. August 14, 1929.
Silene laciniata. No. 24830. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Stellaria longifolia. No. 24831. Ramsey Canon, Huachuca mountains, Arizona. September 27, 1929.
Portulaca pilosa. No. 24832. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.
Portulaca suffrutescens. No. 24833. Baboquivori mountains, Arizona. September 19, 1929.
Talinum paniculatum. No. 24834. Baboquivori mountains, Arizona. September 19, 1929.
Thelypodium. No. 24835. September 30, 1929.
Sisymbrium Vaseyi (?). No. 24836. Miller Canon, Huachuca mountains, Arizona. October 1, 1929. Stigma lobes over partition.
Sisymbrium Vaseyi. No. 24837. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.
Lepidium Thurberi. No. 24838. Benson, Arizona. September 27, 1929. No. 24839. Miller Canon, Huachuca mountains, Arizona. October 1, 1929. This seems a good species from the brilliant white flowers and universal pubescence.

Erysimum elatum. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Arabis porphyrea. No. 24841. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929. This is a dubious species.

Draba petrophila. No. 24842. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929. This appears to be a good species, growing only on the rocks.

Streptanthus tortuosus. No. 24844. Mono Lake, California. June 29, 1929.

Wislizenia refracta. No. 24843. Sacaton, Arizona. October 2, 1929.

Oxytheca Parishii. No. 24845. Arrowhead Lake, California. August 4, 1929.

Berberis Wilcoxii. No. 24846. Ramsey Canon, Huachuca mountains, Arizona. Seeptember 28, 1929.

Delphinium scopulorum. No. 24847. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Clematis Drummondi. No. 24848. Ajo, Arizona. September 18, 1929.

Monnina Wrightii. No. 24849. Ramsey Canon, Arizona. September 30, 1929.

Thalictrum Wrightii. No. 24850. Ramsey Canon, Huachuca mountains, Arizona. Seeptember 28, 1929.

Viola Canadensis. No. 24851. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Euphorbia serpens H. B. K. No. 24852. Babroquivori mountains, Arizona. September 22, 1929. No. 24853. Pichacho Pass. October 2, 1929. No. 24854. Miller Canon, Huachuca mountains, Arizona. October 1, 1929. Curiously Wooton and Standley p. 398 of their Flora of New Mexico put this species under annuals, when it is a woody rooted and rooting perennial. This species is common on little slopes along rivulets or in gulches where there is good drainage in gravelly places. The mats often cover a space two yards wide, and they root at almost every joint, a character not found in any other species of Euphorbia. The internodes are rather long on the main stems and are filiform and smooth. The papery stipules are triangular and mostly entire and conspicuous. The leaves vary from obliquely oval to almost round, and are entire, rather leathery and obtuse, and mostly half an inch long when fully developed. The ultimate branches are short and with imbricated leaves, and with the mostly single flowers about sessile among the leaves. The pods are sharp-angled and smooth, and about 1.5 mm. long, the seeds are orange-colored, nearly 1 mm. long, rather narrowly oblong, but a trifle narrower at tip but not at all ovate, smooth, without any markings or pits, obtusely triquetrous and with rounded back and deeply furrowed face. The appendages are white or pinkish, reniform to obliquely and transversely oblong and about as wide as the pod is long, the glands are purple or black and transversely oblong. The inflorescence is terminal on the branches and always congested, and very late in blooming. The general appearance

of the plants is that of E. albomarginata, but without the white margined leaves, but that plant is never rooting at the nodes. The species is Tropical and is common probably as far north as Phoenix, and at least as far west as Sells, and eastward to Texas and southward. Wooton and Standley evidently followed Coulter too closely in making their keys. Coulter's keys are poor. I don't see how a plant could root at the nodes and be annual. The original description says it is an annual.

Euphorbia setiloba Eng. No. 24855. Quartzite, Arizona. September 17, 1929. This prostrate annual of the stictospora group, has exactly the habit of stictospora and serpyllifolia, and grows with the latter. Whole plant glandular-hairy throughout even to the pods when young, but there are no evident glands on the hairs, but they are evidently viscid and entangle grains of sand and stand out at right angles to the stem. Leaves thin, flat, wholly entire, obliquely ovate to oval, rarely 5 mm. long, opposite, several times shorter than the internodes. Stipules apparently absent or not distinguishable from the hairs. Pods strigose when young, mostly ciliate on the margins when old, about 1 mm. long and with rounded angles. Seeds 2/3 mm. long, ovate to ovate-oblong, whitish, sharply angled and angles not indented., then the faces concave and grooved with not over 6 sulci, and sometimes a little meshed. Appeendages conspicuous and white and lacerate into subulate hairs, the glands conspicuous and black-purple. This differs from E. stictospora and hirtula in the entire leaves and conspicuously lacerate appedanges. Stictospora has the long pubescence but is without appendages, and the leaves are serrate above. Hirtula has very much shorter pubescence, and has crenate and very narrow appendages, and obtuse angled and ovate seeds, and serrate leaves. I do not see any good reason for recognizing the segregates of Euphorbia as genera. The species of this group are too much involved to be good species.

Euphorbia vermiformis N. Sp. No. 24856. Ajo, Arizona. September 18, 1929. Along a dry wash. Perennials, tufted with filiform stems 2-3 feet long, and spreading or prostrate with alternate branches and very long internodes, and almost obsolete stipules. Whole plant ashy to the glabrous appendages which are obovate and 1-2 mm. long and white or pink and very conspicuous, the plant reminding one of E. corollata in that respect. Final branches an inch or two long and with about 3 pairs of leaves which are about an inch long, broadly linear to narrowly oblong, obtuse at both ends but not oblique, involute, entire. Pods with rounded angles, appressed-ashy with very short hairs 2 mm. long, single. Seeds about 1 mm. long, a little oblique, oblong, rounded and obscurely if at all angled but with the 4 ribs very low, and with 4 conspicuous and raised rings, like pediculifera, obtuse. The seeds would put this at once in the pediculifera group, and not in petaloidea, which the plant resembles much. At first sight one would think that this was E. revoluta, but the leaves are

wider and the seeds manifestly like pediculifera.

Euphorbia Missouriensis (Norton) No. 24857. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Euphorbia pediculifera Eng. No. 24858. Ajo, Arizona. September 18, 1929. The leaves of this species are broader and inclined to be reddish or brown above and green below. The seeds are oblong-ovate and acutish, and the appendages are narrow and not prolonged.

Euphorbia pediculifera. No. 24862. Baboquivori mountains, Arizona. September 19, 1929.

Euphorbia hypericifolia. No. 24859. Baboquivori mountains, Arizona. September 19, 1929.

Euphorbia polycarpa. No. 24860. Hayfields, west of Desert Center, California. September 16, 1929.

Euphorbia flagelliformis. No. 24861. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929. The pods of this species are evidently glutinous as they stick to the paper in drying..

Euphorbia chaetocalyx. No. 24863. Baboquivori mountains, Arizona. September 19, 1929.

Euphoribia dentata. No. 24864. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Euphorbia hirtula (?). No. 24865. Arrowhead Lake, California. August 4, 1929. Almost smooth.

Simmondsia Californica. No. 24866. Baboquivori mountains, Arizona. September 20, 1929. No. 24867. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Acalypha Neo-Mexicana. No. 24868. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Acalypha Lindheimeri. No. 24869. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Acalypha Virginica. No. 24870. Baboquivori mountains, Arizona. September 19, 1929.

Argythamnia Neo-Mexicana. No. 24871. East of Desert Center, California. September 16, 1929.

Croton corymbulosus. No. 24872. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.

Croton Neo-Mexicanus. No. 24873. Benson, Arizona, September 27, 1929.

Euphorbia, section of serpyllifolia, glyptosperma group are very unsatisfactory, the characters being based partly on the teeth of the leaves. The seeds are about the same in all. There is much variation in the pubescence. A character that seems valuable lies in the color of the leaves. This character seems to belong to stictospora and hirtula, and is lemon-yellow. But there are forms with this color that are perfectly smooth. There seems to be no other way than to put them all under serpyllifolia.

Euphorbia serpyllifolia (?). No. 24874. Quartzite, Arizona. September 16, 1929. No. 24875. Hayfields, west of Desert Center, California. September 16, 1929. No. 24876. Same locality. No. 24877 a form

(?). East of Blythe in Arizona. Seeptember 16, 1929. No. 24878. Same form. Quartzite, Arizona. September 16, 1929.

Euphorbia hirtula (?). No. 24879. East of Desert Center, California. September 16, 1929.

Euphorbia setiloba. No. 24880. Quartzite, Arizona. Seeptember 16, 1929.

Dalea angulata N. Sp. No. 24881. This would come in Rydberg's genus Thornbera. A woody perennial, herbaceous above, and with the habit of Parryella, with ascending stems two feet long and filiform and freely branching, ashy throughout with appressed white hairs, the calyx silvery. Leaves 1-2 inches long, on a petiole hardly longer than the lowest leaflet, with 6-10 pairs of oval-obovate and emarginate and thickish leaflets about 2 mm. long, which are smooth above and nearly contiguous, but ciliate on the margins and hairy on the back. Racemes 2-4 inches long on a slender petiole, with 10-20 ascending flowers appearing as if spicate at first, but with a minute pedicel which is glandular. Lanceolate bracts as long as calyx tube and deciduous. Calyx about 3 mm. long, almost deltoid in longitudinal section, with 10 conspicuous ribs and gland-bearing furrows between but with no exudate, the triangular calyx teeth about as long as the tube. Petals purple, about 1 mm. longer than the calyx. Growing among rocks at low elevations on the Baboquivori mountains, Arizona. September 22, 1929.

Astragalus oocarpus. No. 24882. Palomar mountain, California. July 13, 1929.

Astragalus Parishii. No. 24883. Arrowhead Lake, California. August 4, 1929.

Muhlenbergia Porteri. No. 24730. Baboquivori mountains, Arizona. September 19, 1929.

Muhlenbergia monticola. No. 24731. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Aristida divaricata. No. 24732. Ajo, Arizona. No. 24733. Baboquivori mountains, Arizona. September 19, 1929.

Aristida Scheideana. No. 24733. Baboquivori mountains, Arizona. September 19, 1929. No. 24734. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Chloris elegans. No. 24735. Ajo, Arizona. September 18, 1929. Acting like introduced.

Epicampes distichophylla. No. 24736. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929. No. 24737. Baboquivori mountains. September 19, 1929. Common among rocks.

Eragrostis lugens. No. 24738. Baboquivori mountains, Arizona. September 19, 1929. No. 24738. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929. No. 24740. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.

Eragrostis pilosa. No. 24741. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Fragrostis megastachya. No. 24742. Sells, Arizona. September 18, 1929. No. 24743. Ajo, Arizona. September 18, 1929; No. 24744. Sentinel, Arizona. September 18, 1929.

Pappophorum apertum. No. 24745. Baboquivori mountains, Arizona. September 22, 1929.

Agrostis exarata. No. 24746. Arrowhead Lake, California. August 4. 1929.

Lycurus pheloides. No. 24747. Ramsey Canon, Huachuca mountains, Arizona. September 20, 1929. Var. brevifolius. No. 24748. Baboquivori mountains, Arizon. September 19, 1929.

Epicampens rigens. No. 24749. Baboquivori mountains, Arizona. September 24, 1929.

Koeleria cristata. No. 24750. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Arundo (?). No. 24751. Baboquivori mountains, Arizona. September 19, 1929.

Trachypogon Montufari. No. 24752. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.

Oryzopsis micrantha. No. 24753. Cushenbury Grade, California. August 17, 1929. No. 24754. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Hilari rigida. No. 24755. East of Desert Center, California. September 16, 1929.

Sieglingia pulchella. No. 24756. Sentinel, Arizona. September 18, 1929.

Yucca Schottii. No. 24757. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Yucca elata. No. 24758. Benson, Arizona. September 27, 1929. Common.

Yucca baccata. No. 24759. Wawona, Nevada. June 15, 1929.

Allium cernuum. No. 24760. Ramsey Canon, Huachuca mountains, Arizona. September 20, 1929.

Brodiaea pauciflora. No. 24761. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.

Lilium Fairchildii N. Sp. No. 24762. Palomar, California. July 13, 1929.

Camassia esculenta. No. 24763. Mono Lake, California. June 29, 1929.

Brodiaea grandiflora. No. 24764. Arrowhead Lake, California. August 4, 1929.

Habenaria Thurberi. No. 24765. Arrowhead Lake, California. August 4, 1929.

Iris Hartwegi. No. 24766. Arrowhead Lake, California. August 4, 1929.

Achyroanthes porphyrea. No. 24767. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Commelyna dianthifolia. No. 24768. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Dasylirion erumpens. No. 24769. Baboquivori mountains, Arizona. September 19, 1929.

Luzula comosa var. No. 24770. Bluff Lake, California. September 4, 1929.

Juncus tenuis. No. 24771. Arrowhead Lake, California. August 4, 1929.

Juncus bufonius. No. 24772. Arrow Head Lake, California. August 4, 1929.

Juncus xiphioides. No. 24773. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Eleocharis arenicola (?). No. 24774. Arrowhead Lake, California. August 4, 1929.

Carex cristata. No. 24775. Arrowhead Lake, California. August 4, 1929.

Carex rostrata. No. 24776. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Cyperus Schweinitzii (?). No. 24777. Baboquivori mountains, Arizona. September 22, 1929.

Cyperus Schweinitzii. No. 24778. Miller Canon, Huachuca mountains, Arizona. October 1, 1929. No. 24779. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Puccinella aquatica. No. 24780. Bluff Lake, California. September 2, 1929.

Salix Bonplandiana. No. 24781. Baboquivori mountains, Arizona. September 23, 1929.

Salix taxifolia. No. 24782. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Salix fluviatillis. No. 24783. Baboquivori mountains, Arizona. September 23, 1929.

Quercus hypoleuca. No. 24784. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Quercus grisea. No. 24785. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Urtica gracilis. No. 24786. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Celtis occidentalis. No. 24787. Baboquivori mountains, Arizona. September 23, 1929.

Aristolochia Watsoni. No. 24788. Baboquivori mountains, Arizona. September 23, 1929.

Acalypha Lindheimeri. No. 24789. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Acalypha Neo-Mexicana. No. 23790. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Acalypha Virginica. No. 24791. Baboquivori mountains, Arizona. September 23, 1929. This species does not seem to have been reported in the region before.

Tragia nepetaefolia. No. 24792. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Tragia ramosa. No. 24793. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Allionia incarnata. No. 24794. Baboquivori mountains, Arizona. September 22, 1929.
Boerhaavia Caribaea. No. 24795. Ajo, Arizona, September 18, 1929.
Stevia Plummerae. No. 25065. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Eupatorium incarnatum. No. 25067. Baboquivori mountains, Arizona. September 19, 1929.
Eupatorium Arizonicum. No. 25068. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Gutierrezia linearifolia. No. 25069. Baboquivori mountains, Arizona. September 19, 1929.
Brickellia brachyphylla. No. 25071. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Solidago occidentalis. No. 25078. Bluff Lake, California. September 2, 1929.
Solidago nemoralis. No. 25079. Baboquivori mountains, Arizona. September 23, 1929.
Solidago decumbens. No. 25080. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Heterotheca subaxillaris. No. 25081. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.
Lessingia glandulifera. No. 25082. Baldwin Lake, California. August 17, 1929.
Bigelovia Douglasii var. No. 25083. Baldwin Lake, California. August 17, 1929.
Bigelovia nauseosa. No. 25084. Bear Lake, California. August 17, 1929.
Aplopappus gracillis. No. 25085. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.
Aplopappus Wrightii. No. 25086. Sentinel, Arizona. September 18, 1929. No. 25087. Baboquivori mountains, Arizona. September 24, 1929.
Aplopappus Cooperi. No. 25088. Baboquivori mountains, Arizona. September 22, 1929.
Erigeron Canadensis. No. 25089. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.
Erigeron Neo-Mexicanus. No. 25090. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.
Corethrogyne filaginifolia. No. 25091. Arrowhead Lake, California. August 4, 1929.
Aster adscendens. No. 25092. Arrowhead Lake, California. August 4, 1929. No. 25094. Benson, Arizona. September 27, 1929.
Aster tanacetifolius. No. 25093. Miller Canon, Huachuca mountains, Arizona. October 1, 1929. No. 25095. Baldwin Lake, California. August 17, 1929.
Galinsoga parviflora var. semicalva Gr. No. 25094. Ramsey Canon, Huachuca mountains, Arizona. September 27, 1929.
Xanthocephalum Wrightii. No. 25095. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

CONTRIBUTIONS TO WESTERN BOTANY NO. 16

Eupatorium solidaginifolium. No. 25116. Baboquivori mountains, Arizona. September 23, 1929.

Brickellia venosa. No. 25101. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Brickellia reniformis. No. 25102. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Brickellia Wrightii. No. 25103. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Brickellia betonicaefolia. No. 25104. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.

Brickellia grandiflora. No. 25105. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Brickellia chenopodina (?). No. 25106. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Brickellia floribunda. No. 25107. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Brickellia Rusbyi. No. 25108. Baboquivori mountains, Arizona. September 19, 1929. No. 25109. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Brickellia axillaris. No. 25114. Baboquivori mountaïns, Arizona. September 25, 1929.

Senecio Hartwegi. No. 25115. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Heliopsis parvifolia. No. 25118. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Encelia frutescens. No. 25119. Castle Dome, Arizona. September 17, 1929. No. 25120. Quartzite, Arizona. September 17, 1929.

Encelia exarata (?). No. 25110. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Tithonia Thurberi (?). No. 25121. Baboquivori mountaïns, Arizona. September 23 1929.

Riddelia tagetina. No. 25097. Benson, Arizona. September 27, 1929.

Madia sativa. No. 25098. Arrowhead Lake, California. August 4, 1929.

Baileya pleniradiata. No. 25099. Sentinel, Arizona. September 18, 1929.

Verbesina longifolia. No. 25117. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Verbesina Wrightii. No. 25100. Benson, Arizona. September 27, 1929.

Viguieria cordifolia (?). No. 25111. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Gymnolomia multiflora. No. 25096. Baboquivori mountains, Arizona. September 19, 1929.

Gymnolomia multiflora var. annua. No. 25112. Benson, Arizona. September 27, 1929.

Carminatia tenuiflora. No. 25060. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Centaurea Americana. No. 25077. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Hymenatherum pentachaetum. No. 25028. Benson, Arizona. September 27, 1929.

Pectis angustifolia. No. 25029. Hayfields, west of Desert Center, California. September 16, 1929.

Heterospermum pinnatum. No. 25030. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Bidens Bigelovii. No. 25031. Baboquivori mountains, Arizona. September 23, 1929.

Palafoxia Hookeriana. No. 25032. Mohawk, Arizona. September 17, 1929.

Helenium Bigelovii. No. 25033. Bluff Lake, California. September 2, 1929.

Senecio MacDougali. No. 25034. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Hieracium Fendleri. No. 25035. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Peritule coronopifolia. No. 25036. Ramsey Canon, Huachuca mountains, Arizona. September 27, 1029.

Balsamorhiza deltoidea. No. 25037. Palomar, California. July 13, 1929.

Ximinesia encelioides. No. 25038. Baboquivori mountains, Arizona. September 24, 1929.

Trixis angustifolia. No. 25039. Baboquivori mountains, Arizona. September 20, 1929.

Hymenothryx Wislizeni. No. 25040. Ajo, Arizona. Seeptember 18, 1929.

Wrightii. No. 25063. Ramsey Canon, Huachuca mountains, Arizona. September 29, 1929.

Schkuhria Wrightii. No. 25041. Ramsey Canon. Huachuca mountains, Arizona. September 28, 1929.

Zinnia grandiflora. No. 25042. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.

Zinnia pumila. No. 25043. Baboquivori mountains, Arizona. September 25, 1929.

Parthenium incanum. No. 25070. Baboquivori mountains, Arizona. September 27, 1929.

Flaveria repanda. No. 25044. Benson, Arizona. September 27, 1929.

Melampodium hispidum. No. 25045. Ramsey Canon, Huachuca mountains. September 29, 1929.

Tagetes Lemmoni. No. 25046. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Bahia oppositifolia. No. 25047. Benson, Arizona. September 27, 1929.

Erigeron Philadelphicus. No. 25048. Ramsey Canon, Huachuca mountains, Arizona. September 27, 1929.

Ambrosia trifida. No. 25049. Benson, Arizona. September 27, 1929.

Ambrosia psilostachya. No. 24050. Sentinel, Arizona. September 18, 1929. No. 25072. Ajo, Arizona. September 18, 1929.

Antennaria arida. No. 25051. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Valeriana sorbifolia. No. 25052. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Cacalia decomposita. No. 25053. Ramsey Canon, Huachuca mountains, Arizona. September 27, 1929.

Stephanomeria exigua. No. 25054. Badwin Lake, California. August 17, 1929.

Stephanomeria ramosa. No. 25055. Pacheco Pass, Arizona. October 2, 1929.

Perezia nana. No. 25056. Below Miller Canon, Arizona, Huachuca mountains, Arizona. October 1, 1929.

Sonchus oleraceus l. No. 25057. Ramsey Canon, Huachuca mountains, Arizona. September 30, 1929.

Baccharis sergiloides. No. 25058. Baboquivori mountains, Arizona. September 25, 1929. No. 25059. Benson, Arizona. September 27, 1929.

Baccharis glutinosa. No. 25061. Baboquivori mountains, Arizona. September 23, 1929.

Baccharis Bigelowvii. No. 25073. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Porophyllum macrocephalum. No. 25062. Baboquivori mountains, Arizona. September 22, 1929.

Rudbeckia laciniata. No. 25064. Ramsey Canon, Huachuca mountains, Arizona. September 28, 1929.

Cirsium Mohavensis. No. 25066. Cushenbury Spring, California. August 17, 1929.

Artemisia ludoviciana. No. 25072. Miller Canon, Huachuca mountains, Arizona. October 1, 1929.

Franseria dumosa. No. 25074. East of Desert Center, California. September 16, 1929.

Psathyrotes annua. No. 25075. Sentinel, Arizona. September 18, 1929.

Tetradymia inermis. No. 25076. Baldwin Lake, California. August 17, 1929.

Canotia holacantha. No. 25122. West of Wickenburg, Arizona. October 4, 1929.

NEW SPECIES AND NOTES.

Amorpha ovalis N. Sp. No. 25027. Miller Canon, Huachuca mountains, Arizona. October 1, 1929. Plants with the habit and size of A. Californica and shrubby. Leaves many, bluish as if glaucous and appearing as if smooth but really with minute pick-shaped hairs. Leaves 3-4 inches long, narrow, with 6-8 pairs of oblanceolate, rounded and apiculate and mostly folded leaflets about an inch long. Racemes axillary, linear, about 4 inches long and on short peduncles, many-flowered, erect. Pods somewhat reflexed on capillary pedicles 2-3 mm. long. Pods ashy with minute pubescence, not glandular, oval, a little flattened, about 4 mm. long, triangular-apiculate with a stout style about their own length, 1-seeded. There is no evidence of glandularity in the leaves. Stems striate. Flowers absent.

Sisymbrium deflexum (Thelypodium lasiophyllum). In commenting on this species in Cont. 15 it might be worth mentioning that in nine cases out of ten it is impossible to tell how the notch in the stigma stands in relation to the septum, since there is no appreciable notch in most cases. But to hang its place in a genus on this alone, as has been done, and to ignore its manifest relationship to Sisymbrium in other respects, seems to me to be unscientific. In the Synoptical Flora Robinson did not hesitate to keep Thelypodium elegans in the genus in spite of the stigma lobes being parallel with the partition.

The Palms.

In my contributions No. 15 I indicated the infrequency of blooming of the species of Erythea and Washingtonia. Exceptions should be made, however. Erythea edulis is a copious bloomer, having bloomed continuously for seven years here in cultivation, and so has E. armata. Washingtonia filifera has never bloomed in the last seven years to amount to anything till last year, when it bloomed copiously all over southern California, and also fruited. This year, 1929, the same trees bloomed sparsely in Claremont but set little or no fruit.

Yucca Mohavensis.

This plant seldom blooms, but this spring the desert near Cabazon was ablaze with the bloom, but the plants set almost no fruit. This is in the San Gorgonio pass. Yucca Whipplei blooms copiously, but only once from

the same root except the var. caespitosa, and it never has a trunk. Y. Whipplei and elata both have long peduncles and erect and dry fruit, and elata also has a trunk. But Mohavensis, macrocarpa, baccata, Schottii and brevifolia have sessile panicle. The last two and the first have trunks only.

I do not think that much stress should be laid on the color of the leaves in the Mohavensis group, for we have growing in Claremont a tree of Y. Schotti with leaves just the shape, color, and length (3 feet) of Mohavensis but destitute of the marginal threads. No botanist would class the other tree Yucca (J. brevifolia) with this group with sessile panicles because of the thick petals and nauseating odor of the flowers, though the pods are erect and dry and in dense, ovate and sessile panicles.

Yucca marcrocarpa Eng. Bot. Gaz. 6 224 Wooten and Standley give as the proper citation Mex. Bound Torrey 221, but there is no such species described on that page. It should be 222, where the name occurs as a variety of Y. baccata. I do not think the name of Torrey should be considered at all for there is no adequate description of the species there, nor does Engelmann refer at all to Torrey's plant in his description of Y. macrocarpa. In addition to recognize Engelmann's type locality, Santa Rita mountains, Arizona, in canons, gives one an exact opinion of the species, while plains of western Texas near the Limpio is a very vague description, of the type locality. Then there is a great variation between the plains species and the canon species, and it is an open question whether they are the same. If we follow Trelease in his treatment of the Yuccas we must consider Engelmann's Y. macrocarpa the same as Y. Schottii, which name antedates his macrocarpa. This plant (Schottii) is common in the mountains of southern Arizona east of Tucson and does not seem to extend down to the plains. Schott evidently got his material mixed, and so a part of the description belongs to the var. macrocarpa of Torrey, but the macrocarpa of Engelmann is perfectly described and distinctive. The chief difference lies in the glaucous-green leaves of Schotti without any marginal fibers or very few and very fine ones, and a tomentose panicle, and excessively large fruit, which is fleshy, edible, and pendent.

Now what shall we do with the Yucca baccata var. macrocarpa of Torrey? Coville is the first one to erect this into a species, calling it Yucca marcrocarpa (Torr.) Coville. Ordinarily the previous (to Coville's name) publication of Engelmann's macrocarpa would invalidate any later species by the same name. But I think any varietal name should hold precedence over any other name proposed. This would invalidate Engelmann's name macrocarpa, and in this case it comes in quite handily. Then as to the name macrocarpa, Coville of course did not know what he was writing about when he published his macrocarpa, for he intended it to apply to the California plant which Sargent rightly called Mohavensis. But Coville's synonymy requires Torrey's type to be macrocarpa. Now the question is, "What was Torrey's type?" Torrey says the leaves are those of baccata, and the pods a little longer, and this is about all there is to the description, except that it is a small tree. Standley (Fl. N. M. 137) says by inference that the leaves are yellowish-green, but the crucial character he does not mention, namely, the fibers on the edges, whether they are fine or coarse,

which separates Mohavensis and baccata from the Schottii group. In my trip into Arizona in September I found a Yucca abounding on the plains east of Tucson, and out of flower or fruit which had leaves somewhat yellowish or glaucous, and with fine threads on the margins, and which I wondered if it could be a low elevation form of Schottii. This must be the real macrocarpa of Torrey. The leaves of this plant are distinctly shorter than Mohavensis, and much thinner and less rigid than that species. The thick and very rigid leaves of Mohavensis and baccata are very marked from any other Yucca. I am not in a position to say the last word on this species till I have made another trip through Arizona and New Mexico to Texas.

Yucca Schottii var. valida (Brandegee). Yucca valida Brandegee. I was in error in Contributions No. 15 p. 146 in referring this to australis, which is a species with pendent inflorescence, and which Trelease erects into the genus Samuela, and which does not grow on the Pacific slope apparently.

Yucca elata is a characteristic species of the Arizona plains, and is the eastern representative of Y. Whipplei (a plant without fleshy pods). This then takes care of all the usual Yuccas of Arizona except angustissima, and possibly glauca, both of which belong to the dry and erect pod section. Fleming says he has seen the true baccata south of the San Quentin Bay of Lower California. I am of the opinion that it goes over from the La Sal mountains, Utah, to Albuquerque and possibly farther southeast into Texas. Baccata does not grow anywhere west of the Providence mountains, California, and there it hybridizes with Mohavensis.

Canotia holacantha Torrey Pac. R. R. Rep. 4 68 and Bot Ives, also figured in Wheeler's Rep. 81 t I. Whether this and Holacantha Emorvi Gray can belong to the same family (as done by Robinson Syn. Fl. 379) the Simarubiacae is to my mind a big query. Wheeler put it in the Rutaceae. Holacantha is not well figured in the Mex. Bound 45 fig. 8. The ovary splits early into 5 carpels which are obliquely elliptical (Robinson calls them "ovoid") with sharp and triquetrous inner face and ridged along the suture, and either triquetrous or obvoid in cross section, and often with a sharp outer ridge, and nut-like, and very bony in texture, the whole very different in appearance from Canotia. But the plants of the two species have the same habit except that Canotia seems always to grow on ridges while Holacantha prefers dry washes, and I have never seen it growing on ridges. To look at, the plants seem identical at a distance, being green throughout to the main trunk, whose bark is brown like that of Quercus Gambelii. Both genera have the twigs erect and close-pressed to the main stem. Holacantha has its twigs rigid and very offensively spinose and sharp, making it difficult to get specimens of the flowers and fruit. But when you approach Canotia you find the twigs are very often without spines, and even when spinose the spines are short and the twigs flexible and rather soft. The fruits of the two genera are conspicuously different. Canotia has an elliptical fruit fully half an inch long (with round cross section) and ending in a long and fleshy beak. The outer part of the fruit is pulpy and soft and cuts easily, and when fully ripe splits into 10 subulate tipped sections, each suture splitting into two. The pods are erect and single. I found it grow-

ing rather abundantly a few miles west of Wickenburg, Arizona, on ridges along with Cercidium and Prosopis, and Cereus giganteus. The fruits of Holacantha are in dense panicles.

Astragalus Wootoni Sheldon. Minn. Bot. Stud. 9 138. I have always been much amused at Wooton's attempts to keep up his species. I have from him a part of his type labeled in his own handwriting, and the specimen is A. subcinereus, and accords with Sheldon's description where he speaks of it as perennial. It is likely that Wooton has distributed forms of A. playanus Jones as this species, but his type is A. subcinereus.

On page 367 of Wooton and Standley's Flora of New Mexico, in commenting on Astragalus Gilensis Greene, they state that my description of the species does not accord with Greene's and with specimens of theirs. As to that I do not know, but I have in my herbarium a part of Greene's type, from which my description is taken. Greene's descriptions were not always reliable, but there is no mistaking his type.

In his description of Astragalus oocalycis Jones Rydberg says that my figure of the type is faulty. This figure was drawn from the type in my herbarium, and therefore can hardly be faulty. I have always been inclined to think that A. oocalycis is a freak, after the fashion of A. grallator Watson, and A. hyalinus Jones. So far no one knows whether it is or not. But insects do make distortions now and then that are evidently freaks. I do not know if A. hyalinus is a freak of A. triphyllus, but I do know that A. grallator is a freak of A. Haydenianus, and oocalycis is liable to be a freak of A. racemosus.

Astragalus. In the recent issues of the North American flora of Britton Rydberg has his last say on this genus. I confess to a general state of confusion of mind in trying to get order out of this chaos. Rydberg seems to have a perennial peeve at any species of Astragalus I have ever described, and he does not hesitate to put them into synonymy wherever possible, doing great injustice to his reputation for consistency, if he has any. To me it is no matter who has published a species, the simple question is "Is it Good?" I do not see any sense in holding a grudge against those who do not agree with me. They have as much right to their opinions as I have to mine. The only question is as to the soundness of their judgment in each particular case. The psychological element enters into the work of every man, and we find that the very best of all our botanists have blundered continually. The man who does not blunder does not exist. So why should we feel a personal affront when a person shows up our mistakes. In Contributions No. 13 p. 27 I make the fatal mistake of roasting the work of the person who wrote the Cyperaceae for the new Gray's Manual. I did not know at that time who wrote it (and I did not care), and I do not now. It was a poor piece of work. It turns out that Fernald wrote it, and so I earned his everlasting enmity for daring to criticise it. Well, he has been lying for me ever since, and at last he found a small defect in a key of mine, and reversing the old Latin adage of "montes partruient, nascitur ridiculus mus, he makes a mons out of a mus, and he is welcome to it. But to me it is babyish. Rydberg has put himself in an impossible position by assuming that no genus should have more than half a dozen species. Whether this is the cause of his

innumerable spurious genera or not I cannot say, but there are no scientific grounds for them. If there is a real difference between groups then there is some grounds for the erection of a generic name to mark it, but Gray's way of making sections is far better in my opinion.

Now taking up the genus Astragalus in order we find him splitting it into 20 different genera. Now do these proposed genera contain well-marked groups that would lead the average botanist to recognize each group from the species included in it? Let us see. Another question is are the genera grouped in the genetic order? His first genus is Kentrophyta of Nuttall, which is perfectly manifestly a specialization of the "Homalobi" due to altitude of habitat, and for that reason should follow and not precede the Homalobi. The one good species in this group he expands to ten, raising my different varieties to specify rank and omitting, humilimus and sesquiflorus. Any acute botanist in the field will find all of his supposed species confluent. His next genus is Homalobus of Nuttall. The first six proposed species contain at least two and possibly three good species, and this group of six species comes next in the genetic order to Kentrophyta but before it and not after it. Then he brings in (and out of order) Astragalus tenellus, which he splits into six species. This species is manifestly higher in the order of development than Astragalus decumbens (which he puts in a different group and calls it Bougoviani), for the reason that the leaves are more specialized and the stipules connate. I take decumbens to be the most primitive of the Astragali, being nearest to Lotus (Hosackia).

I do not consider it worth while to again go through Rydberg's work and point out every mistake. I do not know a single competent botanist who accepts Rydberg's conception of species and genera. Now that E. D. Merrill is to be at the head of the Botanical Garden at the Bronx we are liable to see a shaking of the dry bones there.

Cogswellia Cottami N. sp. Allied to C. Parryi. Caespitose and densely tufted and acaulestent and stout, a foot high with stout and erect peduncles. Leaf bases large and sheathing and fibrous. Leaves about as long as peduncles, glaucous, rigid, broadly linear, with petiole 1/3 the whole, bipinnate to tripinnate, about 2 inches wide, pinnae rather distant, partly bipinnate, with final divisions linear, acerose and strongly 3-nerved, 4-8 mm. long and decurrent on the rachis. Rays stout, 6-8, about 1-2 inches long and spreading and without involucral bracts. Involucels with 6-10 pedicels, half of them aborting, and in fruit about 8 mm. long, with an equal number of bractllets half as long as the pedicels. Flowers not seen. Fruit elliptical, about 8 mm. long by 4 mm. wide, with the wings fully as wide to twice as wide as the body. Oil tubes 3 in the intervals and 6 on the commissure, large and uniting, fruit nearly truncate at both ends. This may be an extreme form of C. Parryi with fruit twice as large and leaflets linear. Dry hillsides at the Apex mine, on hillsides in the Beaverdam mountains, Utah. June 4, 1929, Cottam, Stanton and Harrison. This species seems to have been collected by Munz, Johnston and Harwood in the Providence mountains, Nevada, also, previously.

Venegasia carpesioides Gray. Supplementary to my remarks in Contri-

lutions No. 15, it should be stated that this is a shrub, 4-6 feet high, with a distinct woody trunk an inch in diameter, with smooth bark, having the habit of the shrubby Encelias of the Cape region of Lower California.

Arenaria aberrans N. Sp. Plants densely caespitose and woody, about 6 inches high and simple and erect from very short and decumbent bases. Leaves densely clustered and rapidly reduced above to hyaline bracts with green midveins above, arcuate, triquetrous, needle-tipped, an inch long, hispidulous below but appearing glaucous, filiform and white margined, from a much widened and hyaline base, upper bracts shorter than the calyx. Stems glandular above the middle as are the pedicels. Inflorescence open, a simple or compound cyme, 3-7 flowered. Flowers white, about 7 mm. long and about as wide. Sepals oval-ovate, 4 mm. long, green and shining in the middle and obscurely 9-nerved for 1/3 the width, the rest hyaline, barely acute when fresh, appressed. Petals elliptical and 7 mm. long and a little longer than the stamens with oval and purple anthers. Capsules conspicuously inflated, deltoid in outline, green, twice as long as the sepals, splitting into 5 lobes at tip and which are purple within. Box Elder County, Utah. Cottam No. 4159.

In June, 1929, I visited El Tobar on the southern side of the Grand Canon and saw the stately monument erected to Major Powell and the band of Government men who accompanied him down the Colorado river in 1871, on that blood curdling trip. The secrecy that has always surrounded that trip and his work surveying the Grand Canon has always been a puzzle to me. Forty years ago or more I made the acquaintance of one of his party, the topographer, Captain F. M. Bishop of Salt Lake City, and he was a fellow townsman for many years till my removal to California. His herbarium made on that expedition has always been in my own collection, all the types not now at Harvard.

On the visit referred to I failed to see his name among the list of those who traversed the Grand Canon, and for this reason I hunted him up, now a very old man, at Salt Lake, and conferred with him about the matter. During the conversation his daughter showed me a transcript of his diary, fragmentary but complete as far as it went, which throws a flood of light on the expedition, and its asinine management. I borrowed the M.S. and have copied it, and some day, may possibly publish it. Captain Bishop was one of the very few educated men in the party, and was the center of the botanical activity, making the best collection, but Mrs. Thompson, the sister of Major Powell, sent her collections to Harvard independently. Captain Bishop was later on the Professor of Botany at the State University in Salt Lake City.

The announcement of the election of E. D. Merrill to the head of the New York Botanical Garden comes as a great surprise to American botanists. It seems to mean the permanent passing of the most disturbing factor in American botany, and we hope the end of personal botany. Californian botanists cannot afford to lose Mr. Merrill, who has endeared himself to all, but the Botanic Garden will be very fortunate if it can secure his services.

List of Herbaria where Types are located. (Panicum.)

Biltmore Herbarium N. C. Chapman's types.
Gray Herbarium. Gray and Watson's types.
Field Museum, Chicago.
New York Botanical Garden, at the Bronx. Herbarium of Columbia University. Torrey Herbarium. Nash Herbarium.
Philadelphia Academy of Science. Nuttall's plans, Buckley's plants, Muhlenberg's plants, Short's plants.
St. Louis Botanic Garden. Engelmann's, Bernhardi's herbarium.
Washington National Herbarium.
Charleston Museum has the Elliott herbarium. North Carolina.
Parry Herbarium is at Ames, Iowa.
Gattinger Herbarium is at Knoxville, Tennessee.
Ashe Herbarium is in the Forest Service Herbarium at Washington.
Lamson Scribner is in the Department of Agriculture at Washington.
Morr Herbarium is in the National Herbarium.
Rafinesque and Wood Herbaria not located.
Jones Herbarium is at Pomona College, California.

European

Antwerp. Herbarium of Van Huerck contains Salzmann's plants (Brazil).
Attersee. Has the herbarium of Hackel.
Berlin contains the Willdenow herbarium at Dahlem-Steglitz.
Brussels contains Fournier's plants, and specially Galeotti's plants.
Copenhagen. Botanic Garden contains Liebmann's plants.
Florence, Italy Herbarium. Orto Botanico has types of Poiret in the Desfontaine's Herbarium. Also types of Desvaux, Lamarck, and Bosc's plants.
Geneva, Switzerland. The Conserv. Bot. has the Delessert Herbarium.
The DeCandolle Herbarium.
William Barbey and Boissier herbaria are at Chambesy, near by.
Goettingen. Contains the Grisebach herbarium at the Botanic Garden.
Halle.
London Kew contains the Pursh collection.
British Museum contains Gronovius's collection, also material from Radde, Rudge, etc. Also the Sloane herb. with Walter's plants.
The Linnaean Herbarium contains Linnaeus's plans.
Madrid Jardin Bot. contains types of Cavalille and Lagasca.
Munich Konigl. Bot. Mus. contains Martius's plants of Brazil described by Ness and Doell. Also duplicates of Swartz and Lagasca.
Paduo Orto Botanico has plants of Bosc.

Paris Mus. Nat. Jardin des Plantes has types of Bonpland, Desvaux, Fournier, Richard, and Steudel. Also at Paris is the Michaux herb., the Jussieux herb. and Lamarck herb. The Cosson Herb. contains the Poirer types. The Museum has now the Franqueville herb., where are types of Michaux and Richard and Schaffner's plants.

Prague has Haenke's plants.

St. Petersburg. The Herb. of the Botanic Garden has Karwinsy's plants, F. Mueller's and some of Fournier's plants. At the Academy Imp. are Trinius's plants.

Stockholm has types of Fries and Lindman, and Swartz plants.

Vienna has an important herbarium. This has the Hackel Herb. at Battersee.

Salix in southern California. The earliest willow which blooms in this region is Salix lasiolepis. It was in bloom January 1st and still is blooming (February). It is the most common willow, and is evidently related to S. cordata, having the two stamens, black-tipped scales and smooth pods, and catkins without leafy bracts, coming out before the leaves. Bebb in the Flora of California makes a variety out of a form said to have leafy bracts, but this variety is probably a form of laevigata, which grows with lasiolepis, but does not bloom till a month later. The stems of lasiolepis, if left to a state of nature, would become trunks 40 to 50 feet high and two to three feet in diameter, appearing like the other black willows, but most of the southern Caliornian plants are shrubs, some 15 to 20 feet high, with many trunks which are straight and erect, smooth, and greenish-gray, and a few inches thick, and branching racemosely above. The plants are inclined to be deciduous, but leaves often hang on all winter. The leaves are whitish below and green above.

Salix laevigata grows more sparingly along with lasiolepis and is more inclined to be a tree and more like an evergreen. The male trees sometimes have red twigs, but otherwise like lasiolepis. The catkins of lasiolepis are always linear and elongated. Those of laevigata (the male ones) are broader and inclined to taper at the ends, and have more than 2 stamens to a scale, which places the species among the black willows. Then the fertile catkins are very slender and leafy-peduncled, and with long pedicels to the fruit. The leaves are waxy-glossy-green above, and the trees bloom a month later than lasiolepis but before the black willows. The leaves of lasiolepis are inclined to be wider above, as in cordata, and are thinner. All the black willows have the tapering tips to the leaves and are inclined to be conspicuously serrate. The black willows are laevigata, nigra, amygdaloides, Bonplandiana and lasiandra.

I suppose that the name of "black" willow arose from the fact that the charcoal used in black powder came from them.

Lilium Fairchildi n. sp. Two years ago I took with my friend, Dr. Fairchild, a trip to the Palomar, a high and short range west of Warner's Hot Springs, in search of lilies and Calochortus. This range goes up into the Middle Temperate and is clothed thickly with Pinus ponderosa, Abies

macrocarpa and Quercus Kelloggii, and whose slopes are covered with the black loam of ages of decaying vegetation. At the hotel we saw a single specimen in a bouquet of a lily of striking peculiarities. The lady at the hotel told me they grew in the meadows. We searched diligently for any lilies in the meadows and found none, and went home disappointed. The doctor has always insisted that the lily is a new one. I have also been sceptical about it, but because of the knowledge of my friend I felt compelled to settle the matter one way or the other. So on a special trip to the mountain in July, 1929, I determined to get it. Arriving at the hotel I fortunately met Mr. Rausch, the one man who knew all about the lily. He informed me that it grew in the pine woods in deep shade, which was a revelation to me, and which would seem to place the lily in the Humboldtii class. He said it was common in the spring but that the cattle ate it off, but he had many growing on his place and in bloom. So over we posted and saw at least 50 of them in bloom. He kindly let me get two plants in bloom for herbarium specimens, and gave me three bulbs, which are now growing. I suppose all the lilies are really grown from root stocks or rhizomes, but in Humboldtii the rhizome is reduced to a mere rudiment if it exists at all, for the roots come out from the center of the base, and the so-called bulb is not oblique, and is made up of several thick and rounded scapes closely aggregated, which are crimped or septate near the base and about an inch long, and the leaves are whorled. In Lilium Parryi there is a true rhizome 2 to 4 inches long covered with short and ovate bulb-like scales, which like the other is buried deeply in the ground, but the habitat is different, being wet meadows, while that of Humboldtii is shady woods, in black muck. The bulbs of Lilum Fairchildi are decidedly oblique, and therefore a reduced rhizome, but forming an ovate or oval bulb or cluster of very many flattened and scale-like flakes, hardly an inch long and crimped in the middle. Otherwise the plants resemble Humboldtii so closely as to be taken for that species except that the spots on the petals are black and without margins. The petals are coiled so as to form a circle and are orange in color, and linear and acuminate at tip, and about 4 inches long. The buds are acuminate and yellowish. The petals are without pubescence or raised processes. The plants are 4-6 feet high and erect and shining, single, with pyramidal inflorescence (in appearance, though really racemose), rarely more than 3-flowered. The leaves are about 12 in a whorl, and smooth and shining, and 4-6 inches long. I take it as pleasure to name this fine lily after its real discoverer, Dr. J. H. Fairchild, of Claremont.

Allium Palmeri Watson. The type of this species is from New Mexico. It seems to have been collected but seldom. I have it now from the Kaibab growing among the junipers on the western slope. That Watson was right in placing it near to bisceptrum is evident. Johnston has collected the species at Granite Well, near Randsburg, California. The species arrests one's attention by its deep pink or purple flowers, at once suggesting A. acuminatum. It has the same tendency for the flowers to have dark midribs and to be lighter below the tip and with acuminate petals. Watson describes the plants as about 8 inches high. I seldom find them over 6 inches high,

with the bulbs two inches of this underground. The leaves are at least ¼ inch wide and thin but concave as in bisceptrum, but hardly half as wide as that species. In drying they seem filiform but they are not. The crests are not rightly drawn in Watson's figure. They are double and flaring. The bulbs are globose-ovate and strongly apiculate, and from the base send out long and filiform underground stems or runners ending in bulblets. The bulbs are white as in bisceptrum and ½ to ¾ inch wide. The outer coat is a dirty light-brown and strongly reticulated with the lateral lines either straight or slightly crinkled, and the vertical lines double krinkled, the meshes being approximately rectangular. Beneath the strong coat of the bulb comes a thin one or two with obscure rectangular markings, and then a forming reticulated coat. The outer bulb coats peel off easily and leave the white bulbs exposed. The plants grow either exposed or in the shade of the junipers. The bulbs do not have innumerable coats as most bulbs do, but are few.

The bulbs of A. bisceptrum produce many bulblets around the base of the mother bulb and seldom have any long rootlets (underground stems) with bulbs on the ends, but each bulblet is attached to the mother by a thread. The figure in King's report, that is the whole plant figured there, is the var. Diehlii and not a part of the real type from the Sierras. The var. Dielhlii is manifestly the parent species and the Sierra form an offshoot from it. But as Watson makes the Sierra form the type of his species we have to put Diehlii as a variety. It is a question whether we should put Palmeri as an extreme form of bisceptrum, which it really is, genetically.

Allium acuminatum. Prof. Cottam of Provo, Utah, sends me this species from Mt. Delenbaugh on the rim of the Grand Canon.

Allium Palmeri. I found this species growing abundantly on the western slopes of the Kaibab among the junipers and pinions. It has the same flat leaves of bisceptrum and evidently is closely related to it. The crests on the ovary were conspicuous and double: the flowers a brilliant purple. Plants about 6 inches high.

Echinocactus Sileri Eng. in Cont. Nat. Herb. 3 376 1896. The fact that Engelmann never published this species is evidence that he doubted its specific character. Britton and Rose, however, with no information about the plant but the specimen in the Missouri Botanic Garden, go to work and make a new genus of it, calling it Utahia because they thought it was gathered in Utah, but Pipe Spring, the real type locality, is in Arizona. From the figure in their Cactaceae there is nothing to separate the species from Echinocactus Simpsoni, but they say the flowers are yellowish. The only sensible way would have been to have ignored the species till they had some definite information about it. But their method was to erect a genus on every little technical difference, the Rydbergian style. I have visited the type locality twice and have hunted for the species but never yet found any trace of it, and so has my friend Ben Johnson of Salt Lake City, an enthusiastic grower of native plants.

Sophora stenophylla Gray. This plant in 1894 was common on the grade going up from St. George, Utah, to Diamond valley. In recent years it has been common along the highway between St. George and the Indian

agency on the Santa Clara. Last year it had disappeared from this locality. This year it grows by the acre on the drifting sands on the hill above Toquerville, Utah, 25 miles east of St. George. I also found it thriving in Canon Diablo, Arizona, near the meteoric crater. This extends its southern range about 200 miles. The type locality is the Moqui region, Arizona. It also grows at Moab, Utah.

Dendromecon Piercei Jones is Hunnemannia fumariaefolia Sweet from Oaxaca, Mexico. To my mind the characters on which this genus depends are not good, and it must be relegated to Dendromecon as D. fumariaefolia (Sweet).

Astragalus Wingatanus Watson. Rydberg has called attention to my error in my monograph on Astragalus in writing this name as Wingatensis. The facts are that it is a straight error of mine, but brought about by assuming that Watson, whose knowledge of Latin was sufficient, would write his Latin names correctly. The contex where he described this species will show that he intended the name to perpetuate the name of Camp Wingate, New Mexico, and not Captain Wingate, for whom the town was named. This would require the name to be Wingatensis, just as I had written it. It is not, however, a matter of much consequence.

Further notes on Echinospermum subdecumbens Parry. On a recent trip through northern Nevada, I saw from Wendover west to Wadsworth many plants, and every one I saw had either white or dirty white flowers. I think pale flowers are the rule and blue ones the exception.

Vergin river. In 1894 I tried in vain to get Coville to adopt the proper spelling of this river and region. The name did not arise from the Latin word "virgin" at all but from the name of a man, Vergin, who lived in the region in the sixties.

CORRECTION TO CONTRIBUTIONS NO. 15.

In the hurry to get this off the press, a few serious errors crept in. On page 94, beginning with "Lies on a mesa" to the end of the page should be at the top of the page.

On page 124 the last two lines of the paragraph on Drymaria crassifolia should follow Callitriche.

Under Callitriche Mexicana the two lines under Drymaria crassifolia are out of place and should immediately precede D. Tepicana.

Add to Mimosa aspera. No. 22995. La Barrance. February 21, 1927.

In studying the Flora of Lower California and adjacent mainland one is struck with the amazing mixup of species. One would suppose that the Bailey Willis theory of age and area would have some application in such a wide country. Merrill has shown that the Philippines have a large number of Mexican immigrants brought there in recent years by ships, doubtless. Now we are continually finding species accredited to Oaxaca and Mexico and Vera Cruz scattered throughout Sonora, Sinaloa and Tepic (Nayarit).

They surely must be immigrants, brought in along the trails by Mexican travelers, but the reason why they persist is that they all belong to the same life zone, the Tropical, which prevails throughout to the very northern limits. We find the papaya growing as luxuriously at San Jose del Cabo as in Oaxaca. We find the cocoanut growing all along the coasts. We find the devil grass as abundant in one region as another, and as much of a curse. For this reason in attempting to identify plants we have to comb the entire republic before we are sure our plants are new. The flora of the republic is the most extensive in North America. To me the theory of Willis has been known, and was known to botanists long before he was born, but never made much of because each species of plant and animal reacts differently to its environment according to its inherent vitality, its adaptability, and means of transportation. The scattering occurrence of many species is evidently a matter of accidental transportation. The localization of other species is an evidence of their recent creation. There are more of these in Mexico than any other region that I know, and on genetic grounds it is to be expected. There is no evidence of forced migration (glacial agencies) as is the case in the United States and Canada. On the other hand human agencies hav been active for half a millenium, but only by the transportation of animals, and not machines, as now.

CRITICISM.

In a recent issue of the American Botanist, the editor in commenting on my Contributions No. 15 says, as he turns its pages, he fears what may come next. I am sorry that he has a guilty conscience. However he need not fear, for I don't know anything about his magazine, but I do know that most editors are cowardly pussyfoots, and there is no animal that I despise more than a coward.

BOTANISTS WHOM I HAVE KNOWN.

C. G. Pringle. My acquaintance with Pringle began by correspondence in the early eighties or late seventies, in a series of exchanges of botanical specimens. Pringle impressed me as a painstaking botanist from the first, and one specially acquainted with the ferns. His specimens always were very fine. I remember getting material of Astragalus Robbinsii from Smuggler's Notch (the type locality) from him. He was also well versed in Carex. In those days very few botanists bothered with Carex or the grasses. After each year's work in the west he would write me asking for more material, and he always had enough to exchange, winding up with a lot of ferns from the Hawaiian islands. Along toward the last he wrote me asking what I thought of his coming west and botanizing in Mexico. My reply was that he better keep out. Then in the spring of 1882 I was at San Diego and Parry told me that he had just arrived, and he suggested that we form a party and go to Ensenada together, which we did. On that trip I saw much

of him. He was then about 40 years old, some 10 years older than I. We had many pleasant visits around the camp fire on the trip. He told me he was of Quaker stock, was married and had separated from his wife because of inability to get along with her, and that this was the reason for his trips west. He was a very mild spoken man, with positive opinions which he never tried to impress on others. He was a very quiet man also. He had a young man along with him as helper, and had his own outfit for traveling, that is a team and wagon and horses. The first thing I noted was his antipathy to poor specimens of plants. He never would collect a specimen unless it was just right. We camped together but each party had his own outfit and got their own meals. Parry and I had Charley Orcutt as teamster and cook, a lazy boy of 19 years who knew a little more about everything than the Almighty.

In later years Pringle specialized on west-Mexican botany and discovered many new species of plants.

Pringle impressed me as a very conscientious man, absolutely on the square about everything. I have known men who knew him in Mexico, and at whose places he stayed while botanizing in those regions. He usually sought out the ministers (missionaries) of the regions, and stayed with them.

ASA GRAY.

It is not my intention to give a comprehensive review of Gray's work, but rather my impressions of him as shown by correspondence through some twenty years.

When in the early seventies I found it impossible to identify plants by the books, I wrote to Parry, who was the only botanist I knew of in Iowa, to name certain plants for me. I had never met Parry, but he was a self-advertiser who kept his name before the public as much as possible. Parry was not able to name my plants for me but suggested that I send certain ones to Gray, and certain others to Engelmann. In due time I got a report from Engelmann, who suggested that I consult William Boott for the Carices. Gray replied after a while, and informed me that Watson would report on the plants not named in Gray's report. Thus began my acquaintance with Gray and Watson, neither of whom I ever saw personally.

Gray always wrote in his chicken-track scrawl, which was almost as bad as my own. Engelmann almost always wrote on postal cards in an impossible scrawl, which consisted of a few wiggles at the beginning of a word and then tapered off to a line at the end. The only way it could be read was to take a run at it, a kind of hop-skip-and-jump, and then if you did not get it right you had to start over and guess again. Watson's writing was always legible.

When I began my systematic examination of the flora of Colorado in 1878 I had many plants to identify, and I divided them up among the three men. Engelmann always reported first, then Gray, and last Watson. Gray's reports were always to the point, and gave the latest information. He was always courteous. Once he made fun of me for naming Chenopodium

botrys Urtica urens. As the years rolled by, and the calls on his time became greater, and the infirmities of age became burdensome, his responses were slower and at times quite annoying, because I had to name and distribute my sets before it came time to go out in the field again. In one of these letters I received from him he complained of the burden of years affecting his memory, and saying that he could not finish for some time. This was about December 1st. The day before Christmas I received a fat letter with all the names, and he wound up by saying that this was a Christmas present from him. I never received even a querulous letter from him at any time.

Since I was giving my entire time to a study of the flora of the West, I rapidly became proficient and needed less and less help in identifying. This also led me to see that the judgment of both Gray and Watson was at fault in certain cases, for they did not know the ecological conditions under which my plants grew. In the genus Arabis I found Watson's determinations unsatisfactory, and it reached such a point that I informed him that I would publish my own names for certain species of Arabis unless he agreed to respect my manuscript names for them when he made his revision. He never replied to this but he respected my name, Arabis pulchra, that I gave to a certain species from western Nevada, and he made several new names for plants that I had collected and which I felt were new. This is the nearest I ever came to any friction with either of these men.

I began early to publish notes in the Botanical Gazette and Torrey Bulletin, and in the early eighties I sent an occasional new species. It was at this time that Greene also began to publish new species in those magazines.

Gray was waging a bitter struggle with death to finish his great synoptical flora before the end, and he felt that the publication of our new species was unjustifiable till he had had his say. I know this not from any word from him to me but from his writing to Coulter and Gerard, editors of the Gazette and Bulletin, demanding that they do not publish any of our new species till they had his approval. I know also that it annoyed him, for his comment on my description of Iva Nevadensis (Synoptical Flora), where he goes out of his way to criticise my description of the akenes as being striate, when he says they are not striate. Of course anyone who will examine the mature akens will find that they are striate just as I described them. In his criticism of Buckley, Gray showed the same unfairness, and lack of discrimination. In other words, when he was angry he became unreliable. For some ten years I did not offer much for publication till after the death of both Gray and Watson. Then when Zoe began I also began to publish my views on new species. Greene, as everybody knows, became rabid in his hostility to Gray.

My opinion of Gray is that in quantity of product he was the greatest botanist in America, but in quality of work he was inferior to Engelmann. He made some egregious mistakes, as we all do. For example, he described my specimens of Convolvulus pentapetaloides as Breweria minima. He made the genus Hemizonella out of species of Melampodium.

Elihu Hall. He was, as I suppose, the Hall of Hall and Harbour, who collected the first sets of Colorado plants. I never met him but got in cor-

respondence with him in the late seventies, and he sent me a set of his Texas plants. He was much interested in mosses and was very anxious I should get him many mosses, in my various expeditions. His name often appears in the description of mosses by Ausin. He was an indefatigable collector.

Harry N. Patterson. He lived at Oquawka, Illinois, and was the son of the Patterson who owned the Rocky Mountain News. Harry was a printer by profession and got out a check list of North American plants; he also printed my first labels. He was much interested in Colorado botany and made some collections around Gray's peak.

PARISH.

Since the MS. of my last Contributions was written, another and next to the last of the old guard has slipped away into the unknown. S. B. Parish was a polished gentleman of the old school. If he ever had an enemy no one ever knew it. I never knew him to write but one caustic comment, and that was on the disreputable C. R. Orcutt, who also has passed away in Mexico recently. His name is intimately connected with the botany of southern California. He owned a ranch when I first met him in San Bernardino, and he used to take many trips out on the desert in all directions, and he discovered many new species of plants. He was a valued correspondent of mine for many years, which correspondence continued till his death. One of his last letters said that "the hill became steeper and longer" every day between his home and the herbarium at Berkeley, for he died of old age. A great calamity befell him in the Berkeley fire a few years ago, when his home was burned, and with it all his botanical notes and a complete MS. of a book on the flora of southern California. Parish and Mrs. Brandegee were the two most competent to write on the Flora of California, and both died without leaving anything to remain as a permanent monument of their life work.

A. L. SILER.

During the survey of the Grand Canon by the Government, Major Powell who was at the head of the survey, had his headquarters at Kanab, Utah. His sister, Mrs. Thompson, was an amateur botanist who collected quite a number of native plants and sent them to Dr. Gray for naming, among them being a few new species of plants. The gossip among the natives magnified her work into grotesque proportions, as all new things do. Living at Kanab was an old farmer who became interested, and who figured that he might make some money out of collecting native plants and sending them east and to Europe. He was Siler, a kindly and ignorant old man, a Mormon and a polygamist. He was about seven feet tall, and as slim as a rail, and wore about a No. 14 shoe. He was awkward and uncouth, but a real man. He had a ranch up on the plateau among the pinons and junipers at a place called Ranch, where I visited him in 1890. He specialized on cactus, and sent his stuff to Engelmann for naming. He explored the steep slopes of the Grand Canon and got many interesting species. At Pipe Spring,

Arizona, twenty miles to the west and on Cottonwood Creek, north of there, he found a cactus which Engelmann named Echinocactus Sileri. Apparently but one specimen of it is extant and that a dried plant in the herbarium of the Missouri Botanic Garden, got apparently at the spring. It was a query to Engelmann what it really was, and he never published it, but Britton and Rose had the temerity to do so and they made a new genus of it and called it Utahia, because they thought it was got in Utah. Their Latin was poor, for the Romans would have called it Utavia. I have made two visits to Pipe Spring to get this plant btu never saw it. Siler had a large family and one of his girls married one of the local boys. This fellow turned out to be a scamp, and once made a remark about his wife that threw discredit on her. So one of Siler's sons took it up and promptly shot his brother-in-law. This resulted in his being sent to the penitentiary at Salt Lake City. His father appealed to me to try to get him out. So I put the facts before the Governor and the young man was released. However the incident left bad blood between the families, and finally the father of the man whom he shot killed him. This rough and ready way of settling feuds gets results if nothing else. It is not to be assumed from this that the Mormons were dangerous people, for I traveled among them for many years without ever having any trouble.

J. E. Johnson, a much higher grade man than Siler, also collected many plants and discovered a number of new species. His headquarters were St. George, where he had a drug store. He also was a Mormon and a polygamist. I never met him, though he was still alive when I was in St. George first.

Another of those early botanists was John Reading, who kept a greenhouse in Salt Lake City for many years. He was a very fine gentleman, whom I knew for many years. He got a Sedum which was named after Mechan. He also was a Mormon and a polygamist.

WATSON.

Sereno Watson. My acquaintance with Watson was the same as that of Gray, and it is likely that my characterization of him will be defective, but I had a better chance to learn of his capacity than any contemporary botanist for the reason that I worked over the same field. We know little about his early training except tthat he was a college graduate. In the sixties he was a tutor in Iowa (now Grinnell) college and was given the degree of Master of Arts by that college. The next we hear about him is when he walked barefoot into the camp of the U. S. geological survey and applied for the job of botanist to the expedition. This was the survey of the fortieth parallel under Clarence King, and the camp was in western Nevada. W. W. Bailey was the botanist of the expedition and was incapacitated by ill health, Watson coming in at the critical time, and without any recommendations, to replace him. Once in the early years someone asked Torrey where Watson

came from. Torrey pointed to the sky and said nothing. This seemed to be the universal opinion of him at Harvard. I should judge that he was a tall man, dignified and self-contained and formal. His letters to me, which were many, were business-like and to the point and colorless. There never was the slightest degree of friendliness or the opposite in any of them. There was not the companionableness of Gray in any of them.

I went minutely through his greatest work, the botany of the 40th parallel, and I found it the best ever published on American botany. It should be remembered that this was the first attempt to write an ecological botany of any region in this country. Though the subject of life zones was not known in those days, Watson's resume gave all the details necessary for such a study. In his Death Valley report Coville made a clumsy attempt to copy this work, and without any sign of a recognition of where he got his information. I do not know the official title of Watson at Harvard, but he was in fact an understudy of Gray through many years. His name will always be mentioned in his three great works, the 40th parallel, the Bibliographical Index, and the Botany of California. Watson seems to have done most of the work on the Synoptical Flora outside of the Gamopetalae. Much of his time was taken up by describing and identifying the collections made in the west and in Mexico by various collectors, at a time when the most activity was on in botanical exploration. From time to time he got out synopses of genera and families. He died before his work was complete, died in the harness. In quantity of work he was inferior only to Gray. His judgment was mostly sound on generic and specific limitations. His geratest defect was a penchant for short descriptions.

I began this article on botanists whom I have known, more as reminiscences of the dead, but it has become somewhat comprehensive, and puts me in the position of omitting important names. Cusick was one of our best collectors. He was a most lovable man, a school teacher at Union, Oregon, where his idolized wife died and broke his heart and caused his early death. Then there was Joseph Howell of Portland, Oregon, a great collector who worked under much difficulty and got out his flora with the help of his admirable wife. Then there was Lemmon of Oakland, California, an old soldier of the Rebellion and an invalid. His name is the most mentioned of any in the botany of California. He was suspicious of all other botanists and hard to do anything with. Then there was Dr. C. L. Anderson of Santa Cruz, who had moved from Carson City, Nevada, whose name is often mentioned by Watson. There were Mrs. Austin and Mrs. Ames of the Sierras, who did considerable collecting. The most noted botanist of them all was the genial Dr. Albert Kellogg of San Francisco, who, with Dr. Harkness and Dr. Behr, were the argonauts who helped to found the Academy of Science. Dr. Kellogg was red-headed and small, a good artist whose later years were spent on the oaks and whose fine drawings Greene has perpetuated. Dr. Kellogg was the first of all the botanists of our day. There were other botanists whom I never met, but they do not come under my view here.

Theer remain now nothing but riff-raff to name, such as Scribner and C. C. Parry, who were two of the worst grafters; Charley Orcutt, who had much talent, but was petted by Cleveland so much that he swelled up like a toad and—burst. Cleveland was a fine gentleman who specialized on the ferns.

THE "PUSH" AS PEONIZERS.

Some time after putting out my Contributions No. 15 I got the following letter from a well known publisher, whose name I omit for evident reasons:

"Our state botanist informs me that you have issued a very interesting publication called Contribution No. 15. The one referred to is concerned with certain observations on botanical methods. I shall be very glad to get hold of a publication that speaks its mind regarding the elect in botanical circles. I find a lot of stuff is kept under cover if it concerns the 'leaders.' E. L. Greene once wrote a brochure scoring Asa Gray and several more, but he was dissuaded from publishing it. I saw a letter a long while ago from an editor asking whether it was policy to let Aven Nelson have two pages in which to describe some new species. Well, let me have No. 15 as soon as convenient."

That there has always been an attempt to suppress undesirable botanical publications is manifest to anyone who thinks. That the suppression of such things is desirable to the "Push," at least, is also self-evident. But the question is, "What right has the 'Push' to attempt it?" Anyone who is familiar with botanical literature for the last sixty years knows that there was great friction between workers, and when the original workers died there sprang up institutional jealousy, which now is rampant. My first acquaintance with this spirit came when I read Gray's rasping and deserved attack on Buckley for deliberately proposing his own names for new species in the herbarium of the Philadelphia Academy of Science in place of the manuscript names of Nuttall, the discoverer of the species. All older botanists know that money was not available to Nuttall to publish his new species and genera, and for this reason Gray felt that Nuttall had the first right to name his own species, which names should be conserved. In the Flora of North America by Torrey and Gray they carried this out to the limit. But the publications even of Nuttall's names without his sanction angered him, and his correspondence with Gray shows it unmistakably. Gray by the sheer force of his personality and sharp pen awed most men into silence. Then as the years slipped by the homage given to him by all of us because of his remarkably good work led him to feel that he had a vested right in the publication of new names. Along in the eighties there began to come up systematists who had spent their time and money in exploring the great west. The most active of these men were Brandegee, Kellogg, Parish, Cusick, Greene and myself. We were all content at first to send our specimens to Gray for naming. And we were the men who built up the Gray Herbarium. Gray would

farm out the material to Watson, Engelmann, Boott, and possibly some others, but he still held the strings on us all. Then Greene and I soon began to publish our own species, for we felt (rightly) that we knew more about the western flora than Gray did. Gray at once rebelled and tried to shut us off from publication by writing to Coulter (Botanical Gazette), and the Torrey Bulletin and demanding that they do not publish any species by anyone till the proposed species had his approval. This led to the refusal of those journals to publish our species till we had Gray's permission. And later on they published an agreement to that effect, or substantially to that effect. I have in my possession a letter from W. R. Gerard, editor of the Torrey Bulletin, informing me of the fact. My reply to him was that I considered his action as pusillanimous, but that I would follow his instructions if I ever offered any more MS. to him for publication—and I never have offered any MS. to the Torrey Bulletin since. After Gray and Watson died there sprang up a number of botanical publications which failed to heed the compact to submit to Harvard new species; among them was Zoe ,published by the Brandegees. The editors of this journal requested articles from me, and for some years I printed all my new species in that journal. Later on, when my articles got bigger, I felt that it would not be convenient for me to have them split up in various issues, and so I became my own publisher. There never was any attempt on the part of Zoe to restrict my publications, but I felt that it would be better for me to become in fact a free lance, for I felt that soon or late I would come in conflict with the "Push." I have always felt the highest respect for the talent of Gray and Watson, but I also felt that there was no room for czars in American Botany. Robinson has kept up the old tradition about Harvard, and deserved our support, and I consider the continuation of the Synoptical flora by him as a fine piece of work, however much I disagree with parts of it. So far as I am concerned there never has been any attempt on the part of Harvard to restrict my publications since the death of Gray, and any attempt would have been met at once with a rasping refusal. But there has been in another way an attempt to gobble botanical work by subsidizing workers under the direction of the Bronx. No other excuse can be given for the production of Small's flora of the southern states, Rydberg's second flora of Colorado, and Abram's second edition of the flora of Los Angeles. Some years ago I received a request to furnish botanical articles for the Proceedings of the Biological Society of Washington. This request came from the editor. My reply was that I would do so if there was no attempt to dictate to me on the subject of nomenclature, for I would submit to no dictation in the matter. The reply was that they followed the "American Code" and would expect all articles to follow it. I have never submitted any articles. Whether the "Push" still tries to control American botany I do not know, and I do not care. But one would think that there is still an undercurrent in that direction. Since the advent of Coville in the Department of Botany of the Agricultural Department at Washington, there has been a steady reduction in the efficiency of the pub-

lications till the recent publication of Tidestrom's Flora of Utah and Nevada, which is a scream. I suppose that this is due to the peonizing of the workers. Two years ago one of the heads of departments informed me with a great air of heat that he would not let any employee of his department criticise his superior in any matter. Just why certain men at the heads of things in Washington are to be immune from just criticism for their smart Aleck performances deponent saith not. No man who has any self-respect would submit to such a thing for a minute. Everybody knows that for many years that about the only way a man could get up in Washington was to become a contemptible lick-spittle. And if this is still true the quicker we clean the cowards all out the better it will be for American manhood. Everyone knows that all through the ranks of education there is this tendency to demand implicit obedience to superiors. Institution after institution has had a revolt of the professors against domination. In Salt Lake six of the leading professors pulled out from the domination of the Mormon church in the affairs of the state university. Stanford also had its defection, and many other schools.

The explanation of this attempt to dominate scientific men is only an illustration of the age-old fact that all society is run by half-wits. I never have belonged to any society or organization that did not in time come under the domination of such people. The reason is that good men will not fight continuously for any good thing. After a while they get tired of strife, and so they pull out and let the half-wits run things into the ground. Theology is a conspicuous example of the domination of the half-wits. If one should look back a very short time he would find that this great government was started by men tired of the domination of half-wits. For this reason and others like it I insist on doing my own thinking, and I tell those who would dominate me to go to the devil. No doubt it would be a good thing if we could suppress all the half-witted stuff that is printed, but the selection of a censor is the rub. So the American Government was founded on free speech. Now, at this stage, when we are supposed to have acquired a little sense, this reverson to what caused the creation of this nation seems particularly stupid.

These remarks are not meant to apply to the large number of good men who are connected with the Government departments who are disgusted with the peonizing tendency as I am, but who for various reasons are not heard from in proportion to the din raised by the nuts. But I want to make it certain that whatever hue and cry may be raised by the half-wits we in the west are not perturbed, and at least think we still know black from white, and propose to rasp the half-wits wherever we think they need it. In 1897, when I was visiting the Bronx, Britton took me out to lunch and during the course of conversation said that he did not like to be made fun of. I never thought that either he or Rydberg liked it, and my criticisms of them were not written to please them. I always felt that to get under the domination of Britton meant to become peonized, just as Rose later became, and I never hankered for that kind of slavery. I much prefer to pay my own bills and

snap my fingers in the face of the bosses. Of course the cowardly pussyfoots throw up their hands in horror at any baiting of the "Push." Who cares?

Some years past there was an insistent attempt to fasten by improper means on this country the so-called American code. This code has some good features, but is fatally defective in others.

I favor priority of varietal names.

I emphatically oppose "Once a synonym always a synonym."

I oppose redundant names and never shall use them, such as Astragalus astragalinus.

I oppose the required descriptions being in Latin, for the reason that English is today the world language. It would not discomode me to publish my descriptions in Latin, but I am opposed to the principle. I was educated for a professorship in Latin and never thought of being anything else. I favor correcting improperly made names without taking them away from the author. Such as Eriogonum trichopes Torrey, which should be trichopodum, the proper Greek term. I freely admit that uniformity is desirable. I oppose recognition of all genera printed without species, unless they were provided later on with species, such as the Adansonian genera. Exceptions should be made whenever they will aid stability. But as we know the whole burden of Nomenclature change today is propaganda. Attempts to get us

I think that the taxpayers of this nation should put an immediate end back to the effete European ways.

to all attempts to peonize workers. I am convinced that there is more of it now than there was in 1894, and there was plenty of it then. Officialdom in Washington right now needs a drastic housecleaning, and the men who think they own the Government should be turned out to grass where the other jackasses are. I am not making any wild guesses when I write this, for I was for 40 years intimately connected with the Department of Justice, the Agricultural Department and Geological Survey in various ways. One example out of the many I could relate as personally known to me is the Coal Fraud cases. I was one of the two chief experts in the cases tried some 15 years ago in Salt Lake City, involving millions of dollars in value of coal laids stolen from the Government by the railroads. After my testimony was all in the railroads begged for a continuance, and at the end of the period came in with a compromise with the Government of all cases. It is a curious fact that the wife of the chief attorney for the Government got a legacy of $50,000 from a realtive who conveniently died at this time, but those of us who bore the brunt of the battle never got more than our per diem and had to fight to get that. I have seen so much incompetence and rascality in the various departments of the Government that I feel excusable for refusing to kowtow to the higher ups when they tap on wood and loudly proclaim their own impeccability. Many times I feel like joining the ranks of those who demand a showdown and reforms to secure a housecleaning, for I think I could make the fur fly. The right of self-expression is an inalienable one in an American citizen, for it was this that caused the Pilgrim fathers to migrate to America and found this nation.

As to whether there is any disposition now on the part of Government officials to inflict silence on the part of employees below them so that they will not dare to tell any truth or express any opinion about the correctness of opinions of their superiors, or any attempt to punish outsiders who disagree with them, certain things which have come up since the publication of my Contributions No. 15 certainly look that way, and whenever I feel sure that this is the fact there will be an investigation of the Department of Agriculture that I think will rattle a few dry bones. The disposition to militarize the Government has had an impetus since the war that is disastrous. No first class men will tolerate any such thing long. And if the departments are to be filled up with slaves the quicker we who pay the bills find it out the sooner it will be ended. Heads of departments are not hired to boss but to serve.

To me the most infamous sin is that of trying to suppress the right to individual expression. We find this tendency everywhere; it is essential to the dominence of the half-wits. It often hurts to have our stupidities exposed, and it pleases to have them glossed over, but the end is always bad. Even the best of men often slop through work that they should do well. If we were always brought up with a short halter it would be far better for scientific research. There is always too much of a tendency to worship our forebears, and to do homage to dignified people, when in fact dignified people are always ignoramuses. This is the cloak they put on to hide incompetence.

Interested parties might speak of this slur on a Government attorney that I have made above, as taking an unfair advantage of a perfectly legitimate event (that might have happened once in a million times) to dicredit an innocent party. No one would regret more than I to make such an error. But certain things in my intercourse with that attorney led me to feel sure that if he could have bribed me he would have done it in the case in point. In addition to his utter incompetence to handle the case was evident to all throughout and had not the opposing attorneys tried to discredit the Government witnesses the case of the Government would have fallen flat. But they were not wise enough to let the witnesses alone and so brought out the facts that definitely defeated the railroads and compelled a settlement rather than to send the experts of the railroads to jail for perjury, and attempted bribery, and the stealing of public documents from the Government archives.

In "Desert" I have written of Dr. Engelmann.